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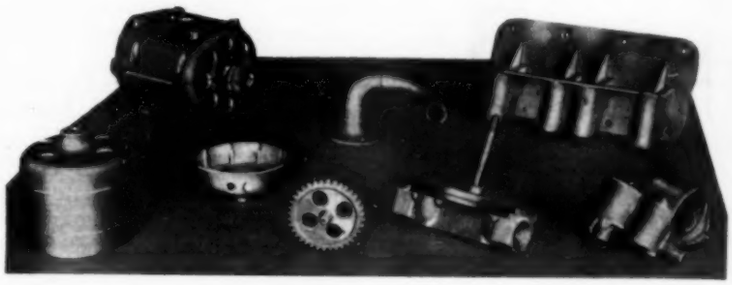


Die-Casting Dies

By Frank W. Curtis
Western Editor, American Machinist

DIE CASTINGS are made by forcing molten metal into a metallic die. The metal is cast under pressure to fill cavities or impressions formed by the joining together of two or more die sections. The number of cavities that may be placed in a die depends upon the size and the design of the casting. Dies for producing small castings may contain as many as twenty cavities. If too many cavities are used, however, poor castings may result since the metal may not be forced to all of the impressions. Large castings and those made with cores are usually cast in a single-cavity die. At the plant of the Milwaukee Die Casting Company, Milwaukee, Wis., objects made of zinc, tin, lead and aluminum metals are included among the die-cast products. Dies for any of these types of metal are constructed along similar lines, although the characteristics of the various metals govern to a certain extent some of the finer points of die design, these being chiefly the shrinkage allowance and the limits of accuracy although there are other important factors.

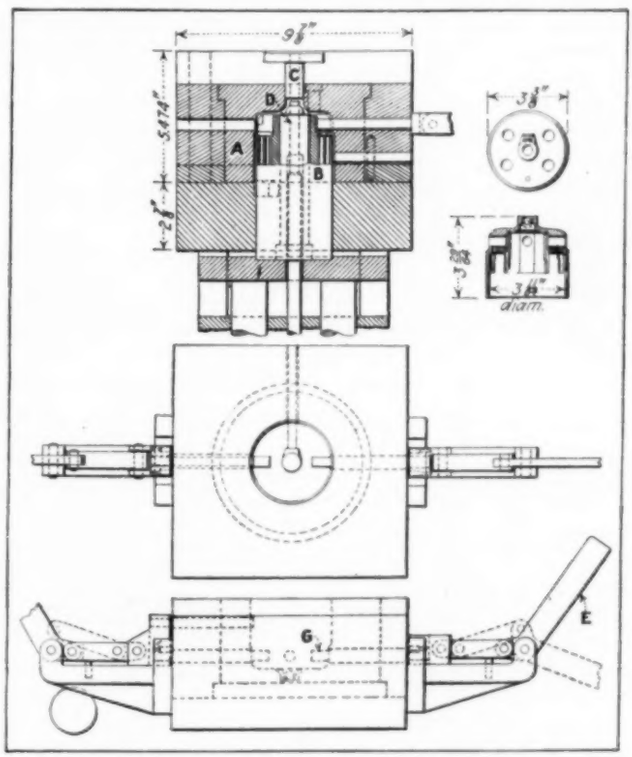


Fig. 1—A single-cavity die for casting the case of a small electric motor. Ejection is by core withdrawal

Pure aluminum is seldom die cast or used for any commercial purpose, since it has been found that the addition of copper and silicon produces an alloy superior to the pure metal from the standpoint of tensile strength as well as of wearing quality. Alloys of aluminum vary in composition, a popular combination being that containing approximately 92 per cent of aluminum and 8 per cent of copper, with which is included a slight amount of silicon. This metal is silver white in appearance and has the following properties:

Weight per cubic inch, 0.115 lb.
Melting point...1,150 deg. F.
Tensile strength, 21,000 lb. per sq. in.
Elongation.....1.5 per cent
Brinell hardness 60.5

The addition of silicon to aluminum tends to reduce shrinkage and thus adds to the ease of ejecting the casting from the die. Scrap due to shrinkage cracks is cut down. The non-cor-

First part of the article. The second and concluding part will appear in an early issue.

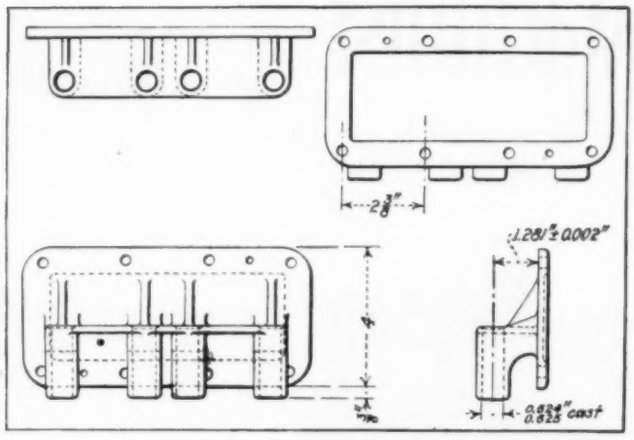


Fig. 2 — Constructional features of a valve-tappet plate that is cast with several cored holes held to a tolerance of 0.002 in. A small amount of metal is allowed in the tappet holes and the two locating holes for reaming

rosive qualities are improved, and other advantages accrue.

When castings are subjected to severe and repeated shocks, an aluminum alloy is to be preferred, since it will not crystallize and does not show signs of fatigue as quickly as other die-cast alloys. When a high polish is required the slight addition of nickel to the aluminum-silicon alloy is recommended.

Generally speaking, die castings can be held within 0.002 in. to the inch of specified dimensions. In many cases, however, they are held within 0.001 in. to the inch. The accuracy depends largely upon three factors, namely, the dimensions under consideration, the taper or draft necessary to extract the casting from the mold, and the kind of metal being cast.

Aluminum alloys have a shrinkage of approximately 0.007 in. to the inch. The shape of the casting is an important consideration when allowing for shrinkage. Very often the steel core of a die prevents excessive shrinkage of the metal. On the other hand, while shrinkage is annoying to a certain extent, it is often convenient because it helps to free the casting from the mold. It is not practical, however, to depend upon shrinkage to release the casting; an ample number of ejector or push pins, or some positive means of stripping the work from the die should be provided. Several examples of die-cast parts are shown in the headpiece, including a motor case, a valve tappet plate, a spur gear and others.

Dies for the majority of these parts are illustrated in the accompanying line cuts. A die for casting the brush end of a motor case is illustrated in Fig. 1, the specifications of the part being included. The die consists of two sections, one containing the impression of the case and the other carrying the core. The die insert *A* and the core *B* are made of high-speed steel, while the other portions of the die are made of carbon steel. In this die the molten metal is forced through the opening *C*, and is cut off after the cavity has been filled by movement of the sprue cutter *D*, which at the same time forms the shaft hole through the closed end of the casting. Operation of the sprue cutter is by a lever connected to the die-casting machine. At the bottom is shown the method of withdrawing the two core pins that form holes in the side of the case. The lever *E* is lowered to the position shown dotted, this operation drawing the pin *G* outward by means of a toggle. Ejection of the work from the die is comparatively simple, inasmuch as the shrinkage causes the casting to adhere to the core when the dies are separated. By drawing the core through the die body in which it is housed the work is freed.

In Fig. 2 is illustrated a die-cast valve tappet plate, in which four $\frac{5}{8}$-in. tappet holes, eight $\frac{11}{32}$-in. bolt holes, and two $\frac{3}{16}$-in. locating holes are cored when the piece is cast. With the exception of the reaming of the tappet and locating holes the plate is finished when cast. The reaming, incidentally, removes only a small amount of stock, just enough to true the holes. The bores of the tappet holes are held to a tolerance of 0.001 in. on the diameter and approximately the same tolerance is maintained for center spacing.

A portion of a die for casting the tappet plates is shown in Fig. 3. The core pins forming the tappet holes are attached to the draw plate *G*, which is locked in the closed position by the shoe *H*. This construction prevents the plate from loosening under pressure of casting. After the part has been cast, the die is opened and the draw plate, operated by two slide plates, is withdrawn by the pinion *J* engaging the rack *K*. The core pins are made larger in diameter where they fit the die body than at the working surface, in order to avoid wear on the working surface as they are withdrawn through the stationary section of the die. One of the pins forming the bolt holes is shown at *L*. These pins are fastened in the die sections. The ejector and pot sections of the die are aligned by four leader pins. Metal is forced through the opening *M* in the pot section, and is cut off by a sprue cutter fitted to the ejector section. On account of the shape of the part it is not necessary to proyide any means of ejection.

A double-impression die for casting external spur

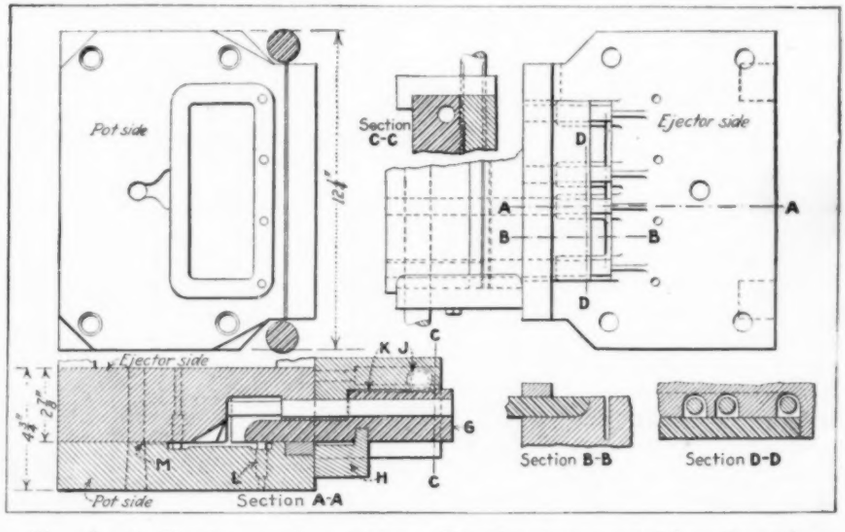


Fig. 3—A die for casting tappet plates, in which are shown the constructional features of the upper and lower die sections. A draw plate, to which four core pins are attached, is withdrawn by a rack and pinion. The plate is prevented from loosening under pressure by a shoe attached to the lower die section. The shape of the part is such that no special ejection device is necessary. Metal is forced through the pot opening M

gears is illustrated in Fig. 4. Details of the gear are shown at the lower right. Two high-speed steel inserts, as shown at *A*, are assembled to the die section *B*, while the mating faces in the die section *C* have the inserts *D* attached as shown. Each gear has two cored holes made by core pins that are withdrawn by plates as shown at *G*. Location of the pins for the casting position is by two stop plugs *H* that strike the side face of the die. Levers and toggle joints are used to operate the plates. At *K* is shown the position of the pins in the die as they appear with the insert removed. Metal is forced in through the hole *L* and is distributed to both cavities by the gate *M*. After the cavities have been filled the metal is cut off by a sprue cutter fitted to the hole *P* in the opposite die section.

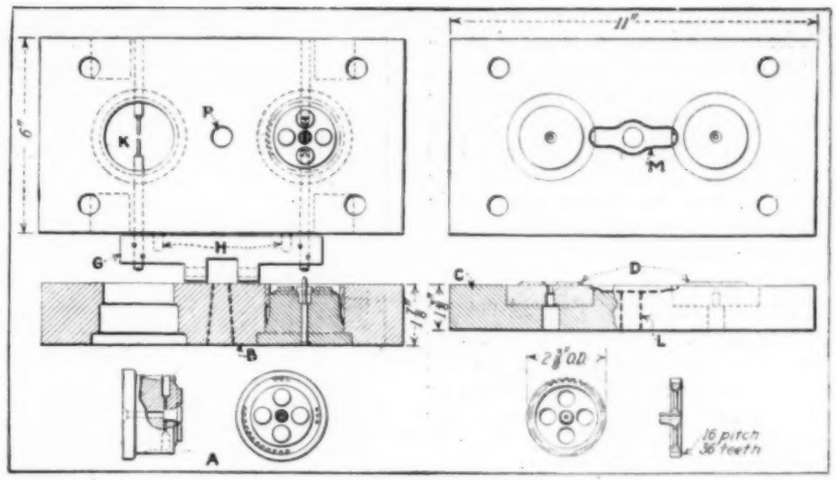


Fig. 4—A die having two impressions and used for casting spur gears. The portions of the die on which the metal forms are made of high-speed steel and are inserted in the die body. Two cored holes are made in the gear by core pins that are withdrawn, after casting, by plates located on the sides

The aluminum alloy previously mentioned has the following limitations in casting:

Maximum weight	5 lb.
Minimum wall thickness	$\frac{1}{16}$ in.
Holes, minimum diameter	0.092 in.
Draft of cored openings	0.005 in. per inch
Side walls of cores	0.015 in. per inch

In casting external threads the practice is to cast them oversize and finish them by a die head. Threads measuring 20 to the inch can be cast. Internal threads are rarely cast unless they are large and of coarse pitch. In casting small holes it is generally preferable to allow a small amount of material for a drilling or reaming finish. Some of the limitations listed can be exceeded slightly but the data shown will serve as a basis in laying out die castings of aluminum alloys.

The metal is cast at a temperature of 1,225 deg. F. and at a pressure of 325 lb. or more, depending upon the size and shape of the work. In starting a run in a cold die it is necessary first to heat the die to prevent cold shuts. Pock marks are the result of an overheated die.

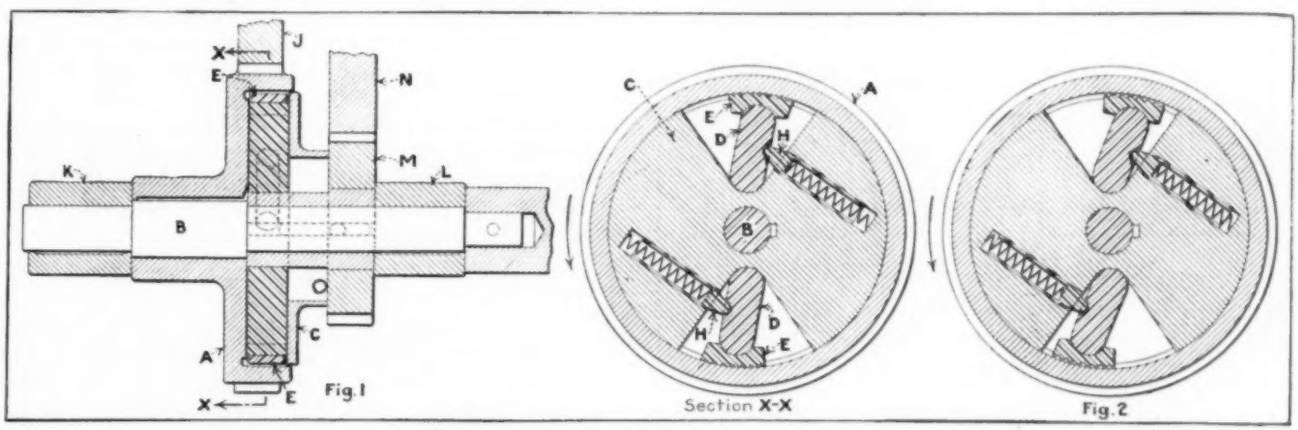
Another requirement in the construction of dies is the use of vents at the matching faces; they have not been shown in the accompanying drawings. As the molten metal is forced into the cavities the gases escape through the vents, which are made by grinding slots in one of the die sections. Vent slots are approximately 0.003 in. in depth and 1 in. or more wide, depending upon the size of the work. The metal enters these slots before congealing, forming thin flashes that are easily trimmed or broken off. Gases pocketed in the cavities by improper venting often cause spongy castings.

An Overrun, Silent Pawl-Clutch

By Adam Fredericks

THE overrun, silent pawl-clutch illustrated in Fig. 1 is both efficient and positive in operation. As shown, it is primarily used as a two-speed drive, returning the table of a special milling mchine at an accelerated speed at the end of the cutting stroke. Running in a bath of oil, there is little or no wear.

Driving action is applied at two points diametrically opposite each other, experience having shown it to have



Figs. 1 and 2—Sectional details of the clutch

a decided advantage over a single application.

The gear *A* is the slow speed member and is free to revolve on the shaft *B*. It is recessed to hold the clutch-mechanism retainer *C*, which is the fast speed member, and is keyed to the shaft *B*. Pawls *D*, pivoted in retainer *C*, hold the clutch shoes *E* in place, assisted by the spring plungers *H*. Gear *A* is driven by the pinion *J*. Shaft *B* rotates in bearings *K* and *L*.

Let us assume that gear *A* rotates at 100 r.p.m. continuously and that gear *M*, functioning only at the end of the cutting stroke of the table by another clutch arrangement not shown, rotates at 300 r.p.m. Gear *M* is driven by gear *N*. This gives a speed up ratio of 3 to 1. Both gears rotate in the direction of the arrow.

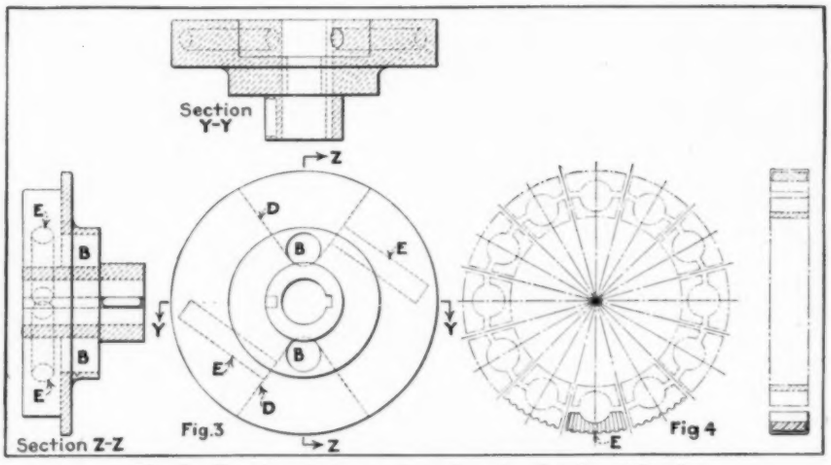


Fig. 3—Details of the retainer for the clutch mechanism
Fig. 4—The clutch shoes

Power is applied to gears *A* and *M* alternately. When power is transmitted to the slow-speed member, causing it to revolve, it pulls or drags the retainer *C*, and consequently the shaft *B*, around with it as follows: The angles made by the clutch shoes *E* with the recess in gear *A*, form a wedging contact between these members. The retainer *C* and the shaft *B* to which it is keyed, then make 100 r.p.m. This causes gear *M*, which is mounted upon and keyed to the hub of retainer *C*, together with its respective driving parts (including gear *N*) to run idly. Gear *M* in this case runs at the same speed as gear *A*, shaft *B* and retainer *C*.

When the clutch shoes are in engagement, as shown in Fig. 1 the whole mechanism is integral and rotates at 100 r.p.m. When the fast speed is thrown into engagement through gear *N*, the shaft *B* rotates through gear *M* and retainer *C* at 300 r.p.m. The clutch shoes *E* being behind the center of rotation and forming a releasing angle, slip along the recess of gear *A* or overrun the slow speed by 200 r.p.m., because gear *A* is running in the same direction at the rate of 100 r.p.m. Fig. 2 shows this position in exaggeration.

In Fig. 3 the clutch-mechanism retainer *C* is shown in detail. Holes *B* are jig drilled and reamed. The angular slots *D* are end milled, the sides being tangent to the holes *B*. The spring-plunger holes *E* are drilled and reamed perpendicular to the sides of the slots *D*. The pawls *D*, Fig. 1, are of tool steel hardened and ground and have in one side a drill-point spot in which spring plungers *H* engage. These plungers are of drill rod, the points being hardened.

The clutch shoes *E* are of hardened tool steel, made in a ring as shown in Fig. 4, and are cut apart after hardening. Grooves are cut along the outer and side faces, the function of which is to scrape the oil from the recess of gear *A*, thereby insuring a good contact.

Across the top face of retainer *C*, a line is scribed at a right angle to the angular slots and in line with the keyway. On pawls *D* a line is scribed lengthwise through the center of the rounded ends before hardening. These lines will be explained further on.

In Fig. 5 is shown the method of checking and setting the pawls and shoes. A gage is bored out to accommodate retainer *C* with gear *M* assembled. The pawls, shoes, plungers and springs are then assembled in the retainer. A central spindle having a key inserted, engages the keyway in retainer *C*. Across the top face of the gage base are scribed lines *H-H* and *K-K*, noted as 10 and 12 deg., respectively. These lines are scribed by the following method. Dimension *J* has previously been determined. Two gages are now made as in Fig. 6, the bodies of which are a tight push fit in the hole in the gage base, the teats projecting above the tops of the bases. Diameter *R* equals 2 *J* sine 10 deg. and diameter *S* equals 2 *J* sine 12 deg. Holding a straight-edge tangent to the teat *R* and passing through center *L*, line *H-H* is scribed. The same is done with diameter *S* for line *K-K*.

When shoes *E* grip, as in the recess of gear *A*, and the scribed line *N-N* on retainer *C* are in line with line *O-O* on the gage, the lines *P-P* must come within the maximum and minimum lines *K-K* and *H-H* on the gage base.

From 10 to 12 deg. is a good holding and releasing angle, although when more power is desired to be transmitted a smaller angle may be employed. An angle as low as 7 deg. has been used in this type of clutch with satisfactory results.

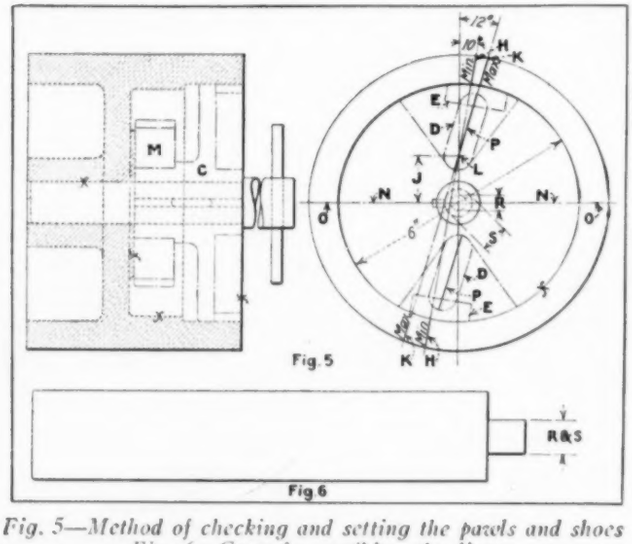


Fig. 5—Method of checking and setting the pawls and shoes
Fig. 6—Gage for scribing the lines

"Too much emphasis cannot be placed on the need for a comprehensive program against unemployment. The various lines of effort against unemployment will fail in individual assaults; they will triumph as units in a co-ordinated attack."—Bryce M. Stewart.

A Question of Family Income

TWO men were riding back from a late afternoon golf match. One of them, of course, was Bill Holland. The other was a young neighbor of his, George Carey, superintendent of the biggest plant in the small city toward which they were headed.

They had left the open country and were entering the outskirts of the city, through a district of bungalows and cottages where many of the millworkers lived. Carey slowed the car as they approached a white cottage conspicuous for its neatness.

The younger man pointed at the house as they drifted past it. "See that little place, Mr. Holland?" he asked. "Every time I go by it my conscious bothers me."

"Why should it, George? Didn't sow a wild oat there, did you?"

"Oh, no, it's much more serious than that. Ed Smiley lives there, with his wife and two daughters. Ed used to work for us. Never was much of a world beater, but he always worked along steadily and made a fair living. His last rate was 75 cents an hour." Carey paused.

"Well, George, I don't see anything so far to upset the tenderest conscience," observed his companion. "What's the rest of the story?"

The car gathered speed. "I'll tell you, Mr. Holland. You know we recently put a new battery of machnes in Department F. They paid for themselves in six months, partly by reducing the labor cost. We use girls in that department now, at 45 cents an hour. Ed Smiley used to work there. Last week I happened to notice that his daughter Jean is in that department now. I don't know what Ed's doing. We tried to find something else for him to do but he didn't seem to be very adaptable and we finally laid him off."

"Men have been laid off before, George."

"I know it, but just see what I've done. Ed was getting 75 cents. Jean gets 45. With Ed out of work the family income has almost been cut in half."

"But there are other shops here, George."

"Yes, but not so many, and jobs for men of Ed's type are scarce in a small place like this. In a big city it would be different. What is my responsibility in a case like this, Mr. Holland, or the company's responsibility, for that matter?"

"That's not an easy thing to say, George. From the economic point of view, you would not be justified in not installing the machines provided they were able to make the saving you have just mentioned. They release fairly high-priced men for other work and provide employment for girls who would have to work much harder to earn the same money elsewhere. Eventually they make possible a wider market through price reductions and an improvement in living standards. You know the reasoning. But the question here is what is to be done in the meantime—in the transition period. I don't know the answer to that question, George. Why don't you put it up to the manufacturer's meeting tomorrow noon and see if there isn't some way to work out a labor exchange that will find jobs for the people who find themselves in Ed Smiley's position, through no fault of their own?"

"All right, Mr. Holland. I'll bring it up tomorrow, but I don't feel very optimistic about getting any real results. Won't you come along over and back me up?"

"All right, George, if you think I can be of any help. Here's my street. Just drop me here. I'll walk in. Good-night."

Executives are invited to discuss the problem involved in the foregoing case. Accepted contributions will be paid for.

Discussion

Which Type of Equipment?

Mr. Holland took the logical point of view in advising the manufacturer not to purchase special equipment in the hope of receiving a big repeat

order from the purchasing company. In my estimation, the situation that faces the manufacturer bears one logical solution, and that is, the use of standard equipment with special attachments and fixtures. The manufacturer is not sure of a big order, and therefore will possibly not get the value out of the special machines no matter how productive they are. Mr. Holland's suggestion that the engineers of the manufacturer use their brains to devise ways of using standard equipment should be followed. If repeat orders are very irregular, and a period of six months or more may elapse between orders of similar character, it may be advisable to absorb the cost of the equipment in the initial order, especially if at the time the order is taken, there is no certainty that it will ever be repeated. —JOSEPH BELL.

About Wage Incentives

Anything that will increase production is worthy of consideration. Mr. Holland in his wisdom professes not to give advice, but proceeds to evidence a clear indication that he views favorably the Halsey premium bonus system. I cannot agree with him, being convinced that the average worker will never in his heart approve it, for he will always have the feeling that his employer is filching from him part of the fruits of his toil. What is the alternative? Be bold, Mr. Hartwell, and offer your men 100 per cent premium. Adopt the plain premium system, and then tell the men that every hour saved will be paid in full. You gain in the reduction of your overhead cost, in your increased production, and in the possibility of booking more orders. —G. W. TRIPP, *England*.

Discouraging Cancellations

There is a good method for the supplier to protect himself from loss by cancellation of a current order, and that is by quoting in two ways. If the buyer wants separate quotations for tools and parts, the supplier is fully protected from loss by cancellation. But often the buyer wants prices on parts with tool costs absorbed. In such a case the supplier should give quotations in two ways; first, as requested by the buyer, second, with tool cost separate and cost of parts separate. The latter should again be split into graded quantities, the smaller quantities because of shorter runs, being slightly higher in price than the full quantity called for. —R. BEAVER.

Efficient administration of all phases of manufacturing has demonstrated the desirability of protecting against trouble before it occurs. Inspections of material saves expense by eliminating the unfit from further handling, and in the case of sales contracts, my preference is to foresee possible shifts in market demands, and hence possible his acceptances, by either quoting separate prices for all special tooling or by stipulation of a sliding scale of prices, based on varying quantities up to the entire total of the contract.

Of these two, the first is preferable, since it passes the excess overhead for special tooling directly to the seller at the outset, when he can in turn set up his own costs per unit; while in the case of the sliding price scale, the tendency is to overlook the possible increase in cost, which in the case of long-time contracts might not become necessary until after a considerable volume of material had been delivered.

In ordinary fairness to a buyer, who obviously cannot foretell accurately what the future holds, a provision should be made and accepted by both sides for a cancellation. But it is equally important that in the event of such cancellation, both sides meet it with open eyes and a clear understanding of what the action involves.

—D. C. WRIGHT.

Setting Prices on Special Machines

Supposing the design of the new special machine is an original construction of the Blank Works, I would try to manage the matter in the following way: I would visit the Blank Works to see how it did the work in question at the present time, and I would calculate the difference in profits that would be made by the Blank Works by the use of the new drilling machine, allowing, of course, a fair amortization for the new machine. Then I would calculate the cost of building the machine, always thinking that I should claim a third part of the difference in profit in two years by the Blank Works, the two years being the supposed life of the new drilling machine. On this basis I would make my offer for one machine, for three machines, or for twelve machines. If the Blank Works would not accept my contribution for the third part of the profit fairly claimed for my work, I would refuse to build the new machine.

—F. BERMANN, *Austria*.

When taking an order for a special machine it must be made to pay. If work is slack there is no advantage in taking in non-paying work. The price of the first machine should be fixed at what it costs to build plus a small allowance for profit. But if an order is afterwards given for several machines these can be built for a reduced price. If the first machine is ordered singly with a promise of further orders the price should still be fixed as for a single machine, but provision should be made for a cut to be made in the price if additional machines are ever ordered. The price should be arranged so that the greater the number of machines ordered the less the price of each individual machine.

—W. E. WARNER, *England*.

Equipment Makes Possible the Ford Model A

Machining operations on the

Flywheel
Flywheel Housing
Clutch Housing

Assembly of the

Transmission

By Fay Leone Faurote, M.E.

THE parts considered in this article belong broadly to the transmission system, and the article may be considered as a continuation of the preceding one. For this reason, the manufacture of the parts included in this assembly will be described by means of illustrations and the operation sheet concerned in each case. The operation sheet for the flywheel housing follows:

Flywheel Housing Operation Sheet

No.	Operation	Machine	No. per Hour
1	Face flange and rough counterbore	16-in. Bullard Mult-Au-Matic	32
2	Mill front face	6-spindle Ingersoll rotary drum-type mill	100
3	Rough bore and chamfer starter hole	No. 25, 24-in. Foote-Burt single-spindle drill, power feed, motor driven	70
4	Mill side arms both sides at a time	24-in.x14-ft. 2-spindle Ingersoll planer-type mill	120
5	Drill 25 holes, fourteen for $\frac{3}{8}$-in. tap, three for $\frac{1}{4}$-in. tap, four 29/64-in. bolt holes, two-in. 15/32-in. bolt holes, two 15/32-in. bolt holes, two 27/64-in. for dowel pin	Special Ford make drill with 25-spindle head 6-station double-index. 4-spindle Baush drills with two 16-spindle multi-heads and two 11-spindle multi-heads, power feed	30
6	Tap eleven $\frac{3}{8}$-in.-16 holes in flange, three $\frac{1}{4}$-in.-28 holes in face.	No. 15$\frac{1}{2}$ Foote-Burt drill with 17-spindle multi-head and reversing motor switch	100
7	$1\frac{1}{2}$-in. spot face two 15/32-in. bolt holes on lugs and $\frac{7}{8}$-in. spot face four 20/64-in. bolt holes	No. 15$\frac{1}{2}$ Foote-Burt drill with 6-spindle head, motor driven, power feed	175
8	Drill two holes for $\frac{1}{2}$-in.-13 tap in left side arm	21-in. Cincinnati drill with 2-spindle multi-head, power feed	100
9	Drill two holes for $\frac{1}{2}$-in.-13 tap in right side arm	21-in. Cincinnati drill with 2-spindle multi-head, power feed, motor driven	100
10	Tap two $\frac{1}{2}$-in.-13 holes in right side arm	21-in. Cincinnati drill with 2-spindle multi-head and reversing switch, hand feed	180
11	Tap two $\frac{1}{2}$-in.-13 holes in left side arm	21-in. Cincinnati drill with 2-spindle multi-head and reversing switch	180
12	Drill 5/16-in. hole on bottom	24-in. Cincinnati single-spindle drill, power feed	175
13	Ream two dowel pin 0.440/0.441-in. holes	21-in. Cincinnati single-spindle drill, motor driven, power feed	175
14	Grind engine face	No. 16 Blanchard vertical grinder, motor driven (temporary)	12
		Special Ingersoll housing, rotary-table grinding machine	80
15	Wash	Blakeslee washer	500
16	Finish counterbore 14.-812'-14.815-in. dimension	No. 25, 24-in. Foote-Burt single-spindle, power feed, motor driven	40
17	Inspect	Hand operation	...

Flywheel Operation Sheet

No.	Operation	Machine	No. per Hour
1	Bore, face and turn front end	14-in. Bullard, single index at bottom	17
		12-in. Bullard, single index at bottom	...
2	Face and turn opposite end and O.D.	14-in., 6-spindle Bullard, single index at bottom, motor driven	25
		12-in., 6-spindle Bullard, single index at bottom, motor driven	...
3	Inspect for eccentricity	Hand operation	...

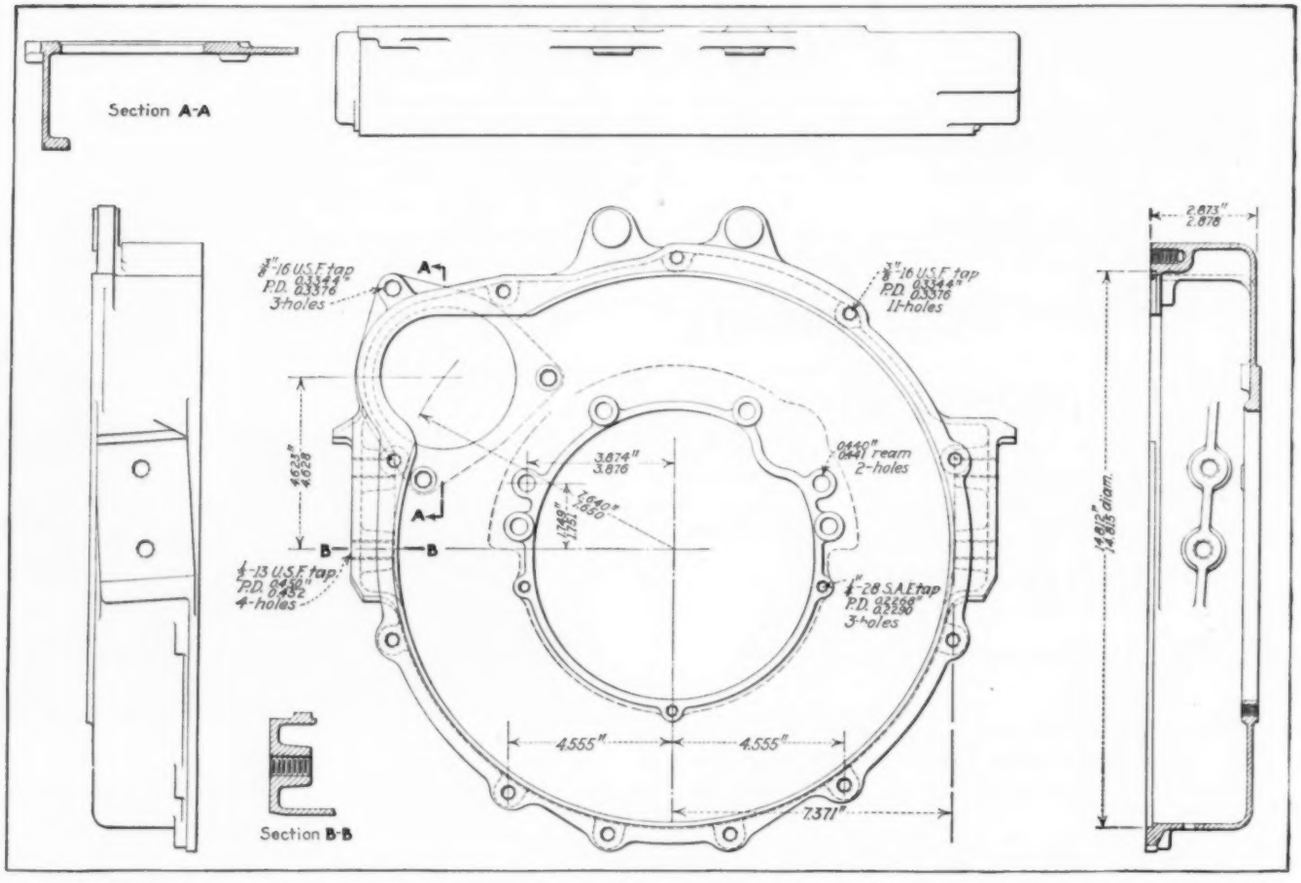


Fig. 1 — The flywheel housing. The operations include facing, boring, drilling, reaming, milling and grinding. Among the machines employed are a Mult-Au-Matic for facing the flange, a six-spindle milling machine for milling the front face, single- and multi-spindle drills and a special rotary-table grinder for grinding the face

4	Drill four $\frac{5}{8}$-in. holes, four 15/32-in. holes and (2) 0.468/0.469-in. holes with combination drill and reamer	Five-way, 9 special Foote-Burt drilling machine	80
4-A	Drill and ream two 0.468/-0.469-in. and (4) 0.440/-0.442-in. holes	No. 2 Baush special 81, 6-spindle drill with double load single index Baush drill	175
4-B	Drill four $\frac{5}{8}$-in. holes	Ford double-head centering machine, motor driven	100
5	Cut teeth	No. 61 Fellows gear shaper	5
	Rough cut teeth (exp.)	PG-6 Ferracute	...
6	Inspect	Hand operation	...

Clutch Housing Operation Sheet

No.	Operation	Machine	No. per Hour
1	Turn and face 14.810/-14.812-in. diameter	16-in., 6-spindle Bullard Multi-Au-Matic	30
2	Mill rear face	48-in. Ingersoll mill. 4-spindle Niles drum type milling machine	120
3	Rough ream 2-13/16-in. and 3-1.496/1.506 in. counterbore in small end, using double size reamer	No. 25, 24-in. Foote-Burt single-spindle drill	70
3½	Finish above operation	No. 25, 24-in. Foote-Burt single-spindle drill	200
4	Drill (11) 13/32-in. bolt holes in large flange, four 15/32-in. and two $\frac{5}{8}$-in. holes in small end, and two 0.440/0.442-in. radius rod connection holes	Foote-Burt three-way 19 special drill	60
5	Drill two clutch release shaft holes for 0.999/-0.1000-in. ream	Ford duplex drill	27
6	Drill two $\frac{1}{4}$-in. holes in radius rod boss	2-spindle facing machines	250
7	Rough drill 1-19/32-in. hole	No. 25, 24-in. Foote-Burt single-spindle drill	85
7½	Spot face and ream radius rod hole	No. 25, 29-in. Foote-Burt drill	110
8	Cut $\frac{3}{4}$-in. spherical radius on radius rod hole	Special Ford machine	150
9	Drill clutch and brake pedal shaft hole for 0.8475/0.8485-in. ream	21-in. Cincinnati single-spindle, motor driven	85
10	Spot face three clutch and brake shaft holes	Ford spot facing machine 2-spindle multi-head	160
11	Spot face two 0.440-in. holes	21-in. Cincinnati drill, hand feed, 2-spindle head	180
12	Line ream two 0.999/1.000-in. holes for clutch shaft bushing	21-in. Cincinnati single-spindle drill	60
13	Ream 0.7475/0.7485-in. clutch and brake pedal shaft hole	21-in. Cincinnati single-spindle drill, power feed	180
14	Drill two $\frac{1}{4}$-in. holes in hand hole flange and rivet hole	21-in. Cincinnati single-spindle drill, motor driven	140

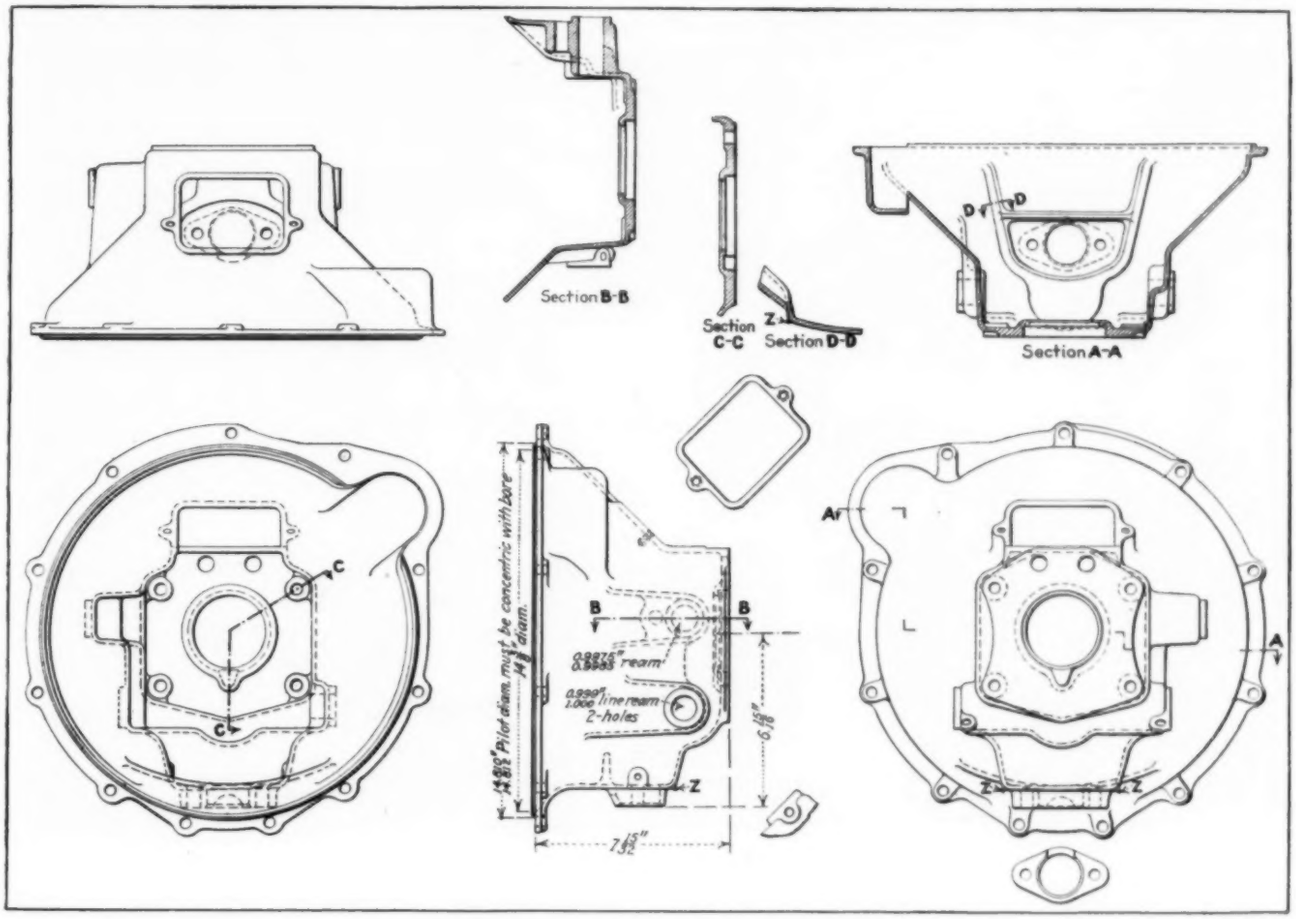


Fig. 2—Details of the clutch housing

15	Press two bronze bushings in clutch release shaft holes	Ford centering machines (temporary)	100
16	Ream two 0.440/0.442-in. holes in radius rod boss	21-in. Cincinnati single-spindle drill, power feed, motor driven	160
17	Drill two 0.308/0.317-in. holes in clutch shaft bearing for oiler	21-in. Cincinnati single-spindle drill, power feed 2-spindle mult. hd.	210
18	Spot face four 15/32-in. holes in small end of housing	21-in. Cincinnati drill with 4-spindle mult-head, power feed. 24-in. Cincinnati mult-head, power feed	180
19	Ream clutch release shaft bushing in place	21-in. Cincinnati single-spindle drill, hand feed	120
20	Tap two 5/16-in.-18 holes in hand hole cover flange	21-in. Cincinnati drill, 2-spindle head, motor driven	150
21	Wash	Blakeslee metal washer	480
22	Final inspection	Bench	...

Clutch Disk Drum Operation Sheet

No.	Operation	Machine	No. per Hour
1-F	Cut to length	No. 4 Hilles & Jones	200
2-F	Heat and forge	Electric furnace	275
3-F	Trim flash	No. 57 Toledo special press	125
4-F	Heat-treat	Gas furnace	200
A	Heat billets for forging	1-Holcroft electric furnace	...
1	Chuck from inside, face top turn O.D. before and ream 0.905/0.906-in. hole	2 8-in., 6-spindle Bullard, single index, motor driven	25
2	Spot face boss, ⅝ to 1⅛-in. dim.	1 21-in. Reed-Prentice drill, hand feed—single spindle	125
3	Drill five ¾-in. holes	1 22-in. Cincinnati Ford-type drill with vertical motor and power feed, used with 5-spindle multi-head	85
4	Chamfer five ¾-in. hole	1 20-in. Cincinnati Ford-type drill with vertical motor and hand feed, 5-spindle multi-head, motor driven	125
5	Spline broach three passes	2 No. 1 Knowles keyseaters, motor driven	40
6	Mount on splined arbor, turn I. D. face bottom and turn dim. on boss to size	2 8-in., 6-spindle Bullard single index, motor driven	30
7	Rough teeth	6 No. 12 Barber-Colman gear hobbers, motor driven	7
8	Finish teeth	7 No. 12 Barber-Colman hobbing machines, motor driven	4
9	Cut groove	1 No. 12 Barber-Colman gear hobbing machine (tem. off A-7100)	20
10	Burr	Hand operation	...
11	Inspect	2 type O Steel City testing machines	...

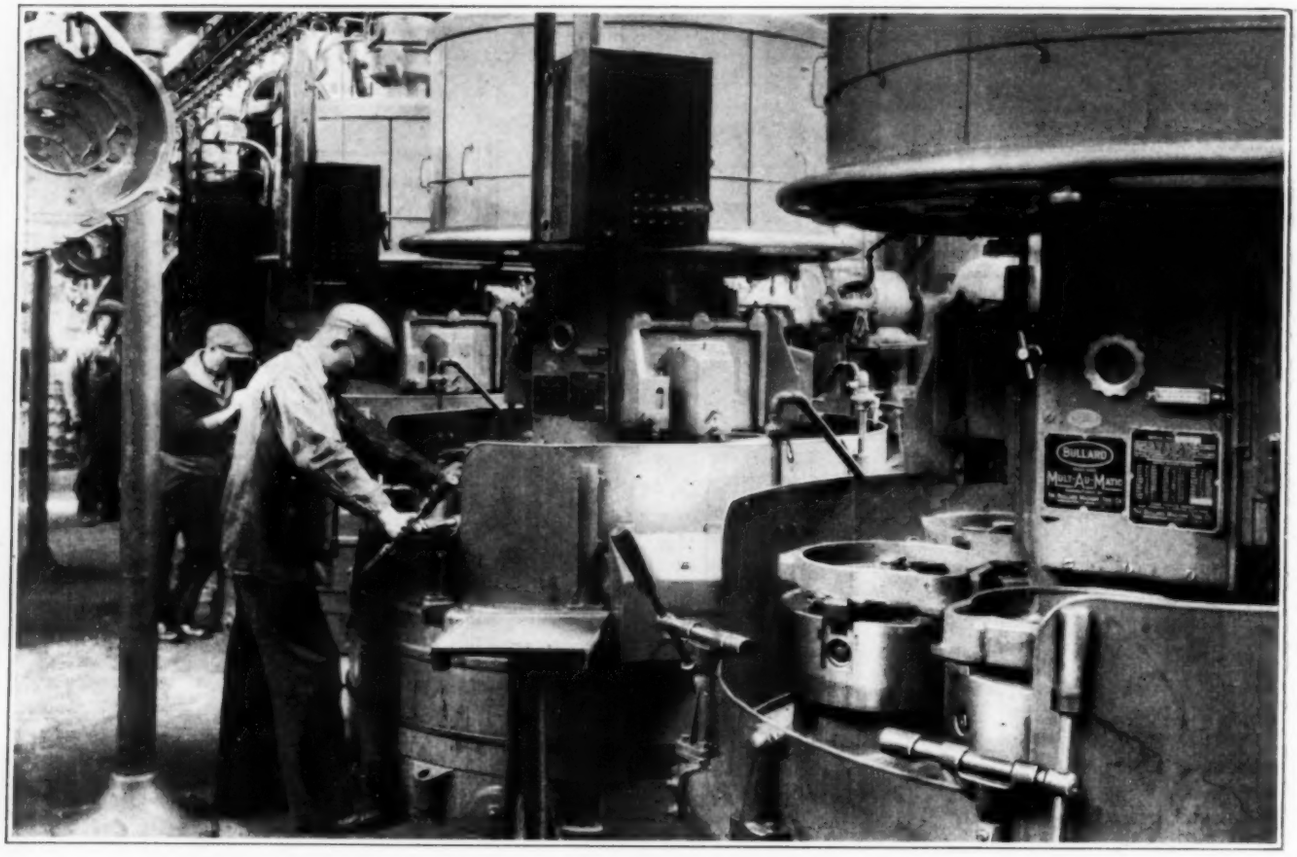


Fig. 3—Facing and counterboring flywheel housings

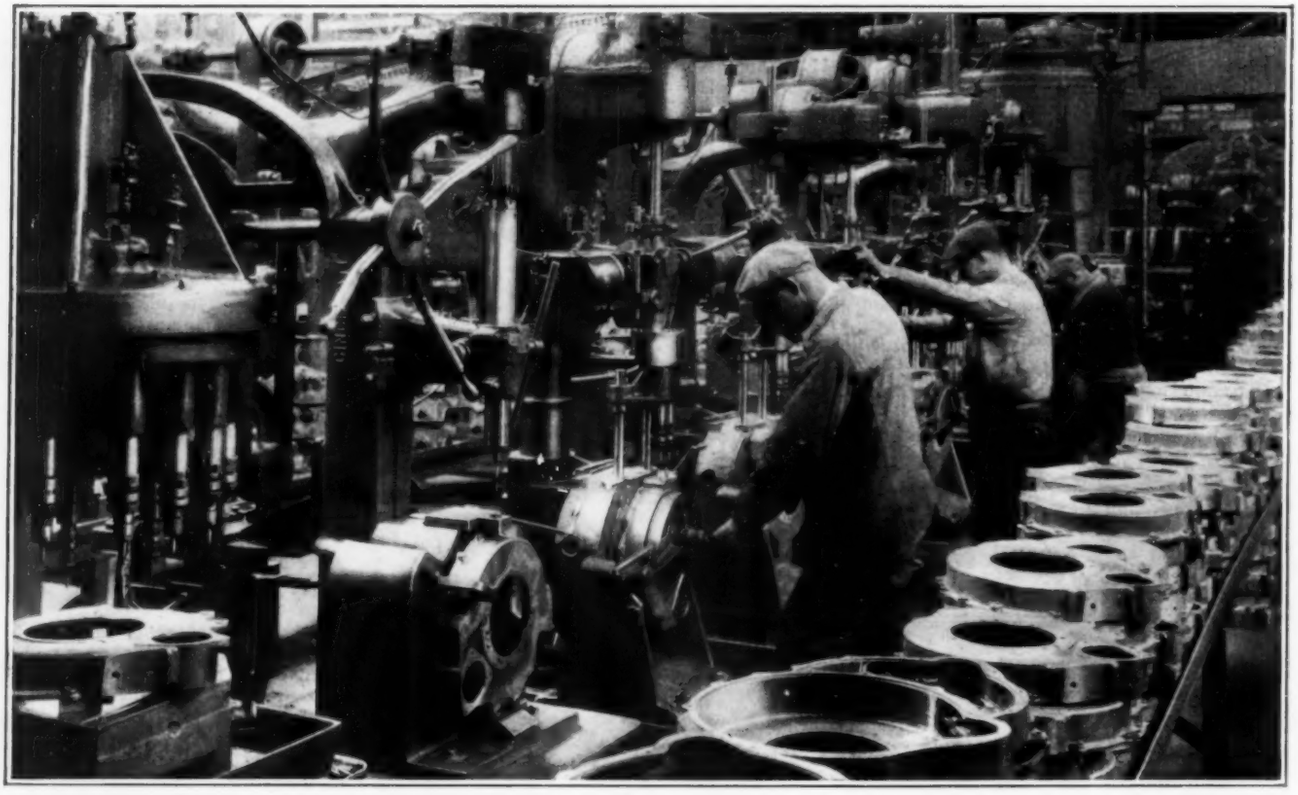


Fig. 4—Drilling, tapping and reaming flywheel housings

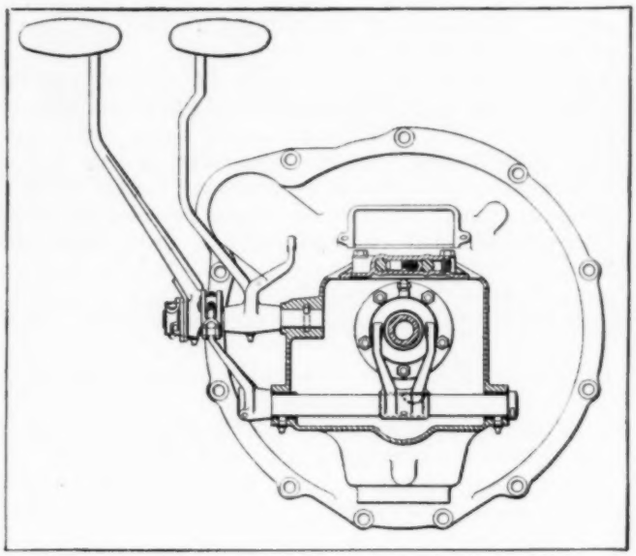


Fig. 5—Transmission and clutch assembly

Transmission Assembly (A-7000) Operation Sheet

No.	Operation	Machine
1	Assemble transmission gear case clutch housing assembly with four washers and bolts	Hand operation
2	Assemble gear shift housing and lever assembly to transmission gear case assembly with gasket, six washers, four screws and two screws	Hand operation
3	Assemble transmission main bearing retainer to transmission gear assembly with gasket, four washers and bolts. Also assemble oiler to retainer	Hand operation
4	Assemble clutch assembly to transmission main drive gear and bearing assembly with washer, nut and cotter pin	Hand operation

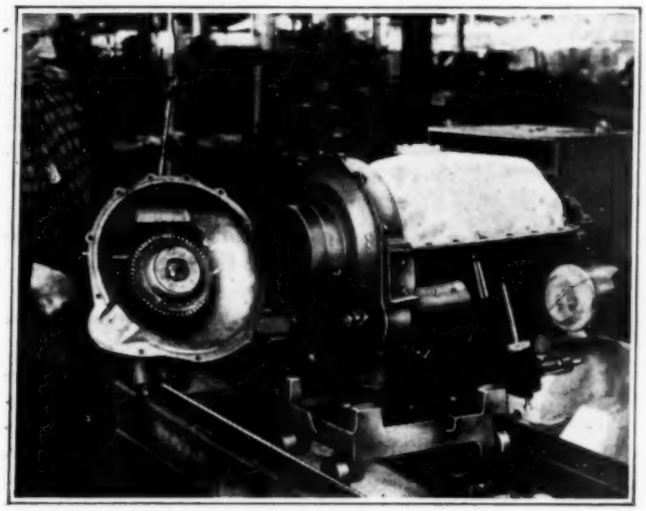


Fig. 6—Assembling the clutch to the engine

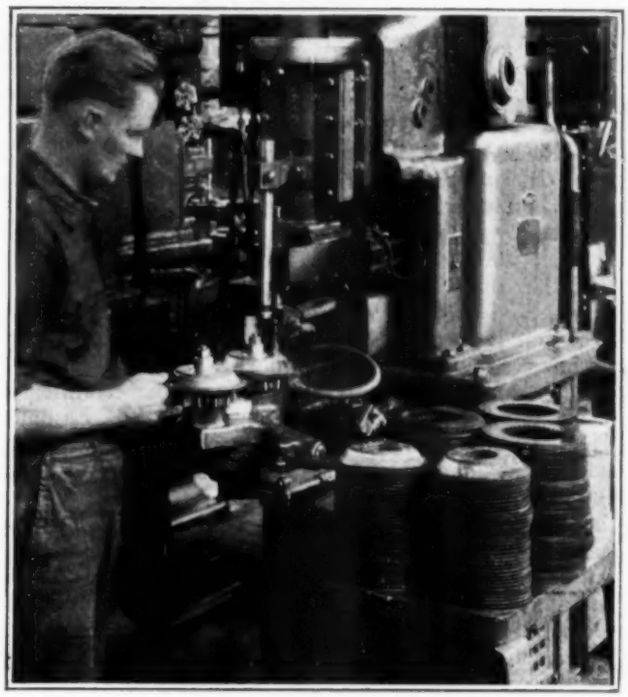


Fig. 7—Spot-welding clutch parts. The machine is equipped with an indexing fixture

5	Assemble clutch housing hand-hole cover to clutch housing	Hand operation
6	Test	Ford noise tester

Transmission Assembly (A-7001) Operation Sheet

No.	Operation	Machine
1	Assemble drain plug	Bench—Socket wrench
2	Assemble transmission countershaft with thrust washer one end inside case and one thrust washer other end inside case. Use temporary shaft to hold thrust washer at other end	Bench—Hand operation
3	Place transmission countershaft gear assembly with roller bearings assembled in place	Bench—Rawhide mallet
4	Assemble idler gear assembly and idler gear shaft assembly to case	Bench—Rawhide mallet
5	Line up idler gear shaft and transmission countershaft for retainer, fasten with one cap screw. Use lock washer	Bench—Socket wrench
6	Assemble gear (low and reverse) and gear, high and intermediate to transmission spline shaft assembly baffle and bearing to case	Bench—Hand operation
7	Assemble transmission main drive gear assembly with bearing (ball race) oil ring, oil retainer and roller bearings, baffle and spacer to gear assembly and assemble to case	Bench—Hand operation
8	Assemble gasket transmission main shaft bearing retainer to case. Use four screws and four lock washers	Bench—Air drill

· BOOK · REVIEWS ·

AMERICAN PROSPERITY. ITS CAUSES AND CONSEQUENCES. By Paul M. Mazur. Two hundred and sixty-eight pages, 5½x8¼ in. Bound in cloth boards. Published by The Viking Press, New York. Price $2.50.

MR. MAZUR'S book has attracted considerable attention, and justly so. His position as a banker gives him an excellent opportunity to judge trends in business by watching developments in various fields without being burdened with the boring details.

Rather more attention to retailing is given than will be required by the average reader in the metal working field, but it has been necessary to complete the picture of business evolution the author is painting. After a short introductory chapter he takes up the evolution of production, distribution, retailing and the consumer. Then comes an analysis of the effect of the War and the subsequent liquidation and readjustment. The next four chapters are perhaps the most interesting, particularly the one dealing with the "Era of Consolidation." What seem like irrefutable arguments for consolidation are presented. If Mr. Mazur is right we are only at the beginning of a period when consolidation will be the order of the day.

Advertising is given great prominence as a weapon of commercial warfare. So is the organization of manufacturing and retailing alliances.

The book is well worth reading; not at one sitting, perhaps, although the style is easy, but in doses small enough to be thoroughly digested before attempting the next one.

THE BEHAVIOR OF PRICES. By Frederick C. Mills, Staff of the National Bureau of Economic Research, New York City. Five hundred and ninety-eight pages. Cloth boards. Published by the Bureau. Price $7.00.

THERE is no question but that prices and price relations play a fundamental part in the production, distribution and consumption of goods. The changes in prices of commodities stimulate or retard production and consumption. But in addition there are numerous relations which tie all prices into a highly complex system, "a system like a living organism in its ability to recover from the serious disorders into which it periodically falls." "The Behavior of Prices" has as its objective first, to secure a fuller understanding of individual commodity prices and, secondly, to increase our knowledge of the price system and of the inter-relationships between its component elements.

The study of individual price series shows that the movements of the general price index are the net resultants of a large number of different movements in the prices of individual commodities. The prices of some of the individual commodities do not seem to compare at all with the general business cycles, and even though they reflect a general cycle in their price movements, they differ materially among themselves in respect to the timing of revival and recession, and in the duration and amplitude of their cyclical swings. Cycles in commodity prices appear as broad tendencies among varied movements. In attempting in this study to trace and measure these tendencies they have been shown against the background of diverse and complicated price fluctuations which constitute a continuing element in the economic situation.

Two significant facts are brought out by the study. First, is the existence of wide diversities in the behavior of prices of individual commodities, and secondly, is the existence among the diversity of price movements of just those uniformities for which the scientist searches in attempting to reduce masses of facts to understandable terms. The present study and those which have preceded it in this field have gone only a little way in the search of principles of order among the variations in the price system, but there have been revealed numerous inter-relations and uniformities, and there have been found many clues to other regularities. It is in the existence of these regularities that lie the hope of a better understanding of the working of the system of prices.

INDUSTRIAL ENGINEERING AND FACTORY MANAGEMENT. By Arthur G. Anderson, Associate Professor of Business Organization and Operation, College of Commerce, University of Illinois. Six hundred and twenty-three pages, 5½x8¼ in. Cloth board covers. Indexed. Published by the Ronald Press, New York, N. Y. Price $5.

THIS volume gives the fundamental organization and management principles governing production and engineering procedure in the modern industrial plant. It is primarily a text-book for students of management and industrial engineering, designed to precede specialized training in any particular management field.

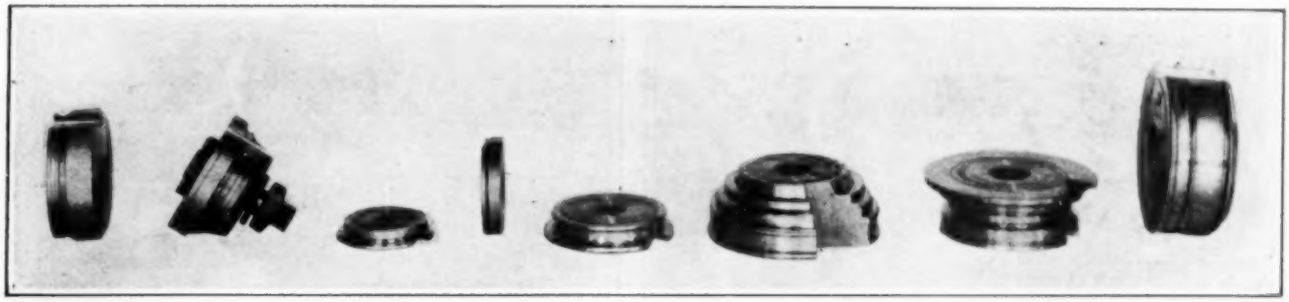
In content and method of treatment, the book reflects the most recent developments in management. After a brief historical introduction, three chapters outline the form of the modern industrial organization. Nine chapters treat of the plant—its location and facilities, types of buildings, construction, production layout and equipment, internal transportation facilities, light, heat and power; also ventilation. Eleven chapters present the principles of economical operation, including elimination of waste, personnel, wage rates and plans. In the last eight chapters, management principles are applied to the particular functions of the enterprise, covering budgeting, purchasing store control, inspection and tool control, production control and standard costs.

The book contains a large number of case applications and is illustrated with many diagrams, forms and photographs. Questions and problems are found at the end of each chapter and are thoroughly practical in character.

EVERYBODY'S AVIATION GUIDE. By Major Victor W. Page, Air Corps Reserve, U.S.A. Two hundred forty-seven pages, 5x7½ in., illustrated, cloth covers. Published by the Norman W. Henley Publishing Company, 2 W. 45th St., New York City. Price $2.

A BOOK of especial value to individuals wishing to understand the elements of the theory of aëronautics and to gain a basis for a working knowledge of airplanes. It is presented in the form of questions and answers, of which there are 600 of each.

As a beginning, a chapter is devoted to early aëronautic history, the first flying machines, and the atmosphere. The remaining nine chapters treat of the various forms of aircraft, elementary aërodynamics, parts, fuselage, landing gears, wings, engines, propellers, equilibrium and control. There is also a list of official world and American air records.



The Form Grinding of Circular Form-Tools

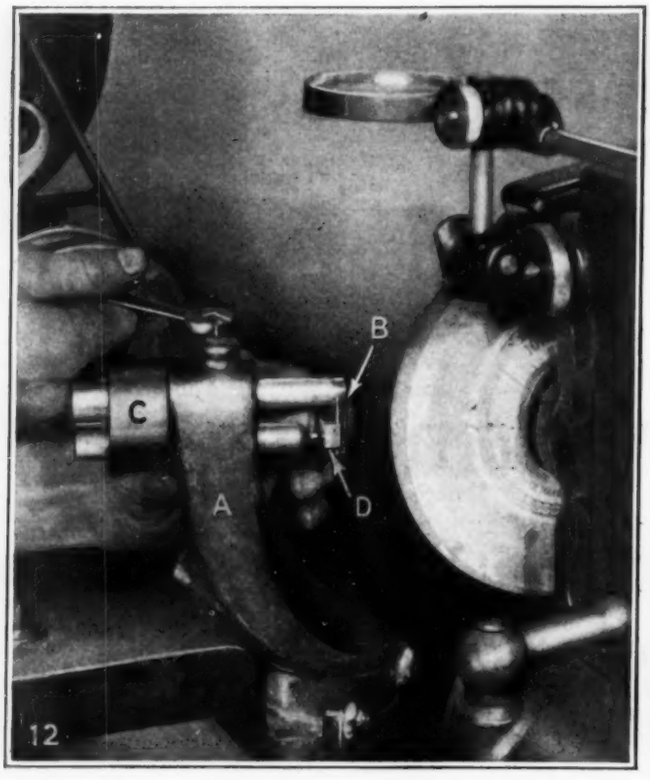
By Ellsworth Sheldon

How angles and fillets are formed on the wheels—The machine itself is the measuring instrument—Patience and carefulness the main qualifications for success

WHEN form grinding circular form-tools it is important to have the axis of the work and of the grinding wheel spindle in the same plane, and to have that plane parallel to the line of advance of the wheel; or, in other words, the line of advance of the wheel must be accurately radial to the work. Unless this condition obtains, the micrometer dial will not indicate truly the amount of reduction in diameter of the work, nor will a formed wheel grind upon the work a true complement of its own contour. Fortunately, since the line of travel of the cross-slide in this machine is horizontal, this condition is assured by making certain that the work centers and the center line of the wheel spindle are at the same level. A level indicator furnished with the machine facilitates the vertical adjustment of the wheel carriage upon the upright and makes this condition easy of attainment, but the adjustment has no other function in connection with the job of grinding the contours of circular tools. It is also of prime importance that the wheel truing diamonds be presented to the wheels at the same level. To sum up, there are two main movements and two principal adjustments of the machine that enter into the problem of grinding irregular contours: the lengthwise traverse of the machine table; the cross movement of the wheel slide—always at a right angle to the traverse; the swiveling feature of the wheel-head by which it (and the wheel spindle) may be set to any desired angle with respect to the axis of the work; and the swiveling feature of the machine table (rarely used) to grind angular surfaces too long to be compassed by the available width of a wheel. The movements are measurable by micrometer dials, dial indicators and vernier scales; the adjustments by vernier protractors. These features are regular parts of, or are attached to, the machine. In addition there is a fixture by which the periphery of the grinding wheel may be dressed to any desired radius to a degree of accuracy corresponding to the other measurements. The fixture is in itself adjustable to either internal or external radii, and, by virtue of the minutely measurable movements of the table and cross-slide, the center of radius can be located quite

Fig. 11—This diamond holder is secured to the table by a T-head bolt, and derives its movements from those of the machine. Its purpose is to dress straight lines and angles on the periphery and sides of the wheel

The third of six articles. The fourth will appear in an early issue.



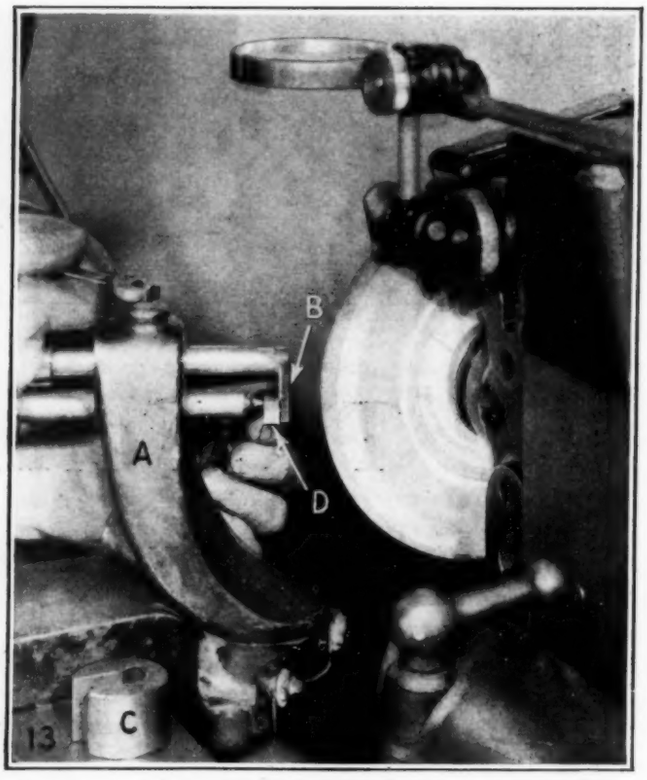


Fig. 12 — Setting the radius truing diamond to round the face of a wheel. The thickness of the gage block is equal to the desired radius. Fig. 13— The same principle serves to set the diamond to concave a wheel. Removing the slip-gage from the finger bar permits the finger to be advanced beyond the neutral point

accurately with relation to the periphery and the side of the wheel.

To prepare a wheel for grinding a parallel surface that is not intercepted in either direction by a shoulder, all that is necessary is to secure the stationary diamond holder on the table by means of its T-head bolt—its position is not important—and dress the periphery by traversing the diamond before it while feeding the grinding wheel forward by means of the cross-feed and handwheel on the front of the machine. The angular setting of the wheelhead is immaterial so long as it is not changed after the wheel has been dressed.

A matter that *is* of importance upon *any* job is that the swivel table be set accurately to zero, for if the line of centers of the work is not parallel to the line of traverse, the micrometer dial of the cross-feed screw will not indicate diameters correctly, nor will angles formed upon the wheels be transferred accurately to the work.

If the wheel is to meet a square shoulder, the wheelhead may be set at any angle from 30 to 45 deg. that will present the wheel conveniently to the work. The periphery of the wheel is dressed as above described, after which the holder is swung around to present the diamond to the side of the wheel, the table is traversed to bring it into contact and the inner corner of the wheel is dressed by running the cross-slide in and out while feeding the diamond by means of the traverse handwheel.

This is the operation shown in Fig. 11. With the slow traverse gears of the table in engagement, a very minute increment of feed is obtainable by the expedient of "bumping" with the handwheel; a practice which takes advantage of the slight amount of backlash always present in a train of gears. The term needs no explanation to the experienced grinder man.

If there are shoulders on both sides, as when sinking a square-bottomed groove in a tool, the wheelhead is set at zero, the periphery of the wheel is trued and both sides are dressed. The thickness can be measured on the stationary wheel by an ordinary micrometer or with a micrometer fitted with the disks. If the object of the dressing is to sink such a channel in the work, the thickness of the wheel should be made 0.001 in. less than the desired width of the channel.

It is not to be expected that the thickness of the wheel will be right the first time, but this first measurement establishes a basis, or point of departure, to render subsequent hand measurements unnecessary. Knowing how many thousandths too thick the wheel is at this stage, the operator sets the dial indicator in position to measure table traverse and continues to dress the side of the wheel until the pointer of the dial shows that the traverse movement is equal to the number of thousandths remaining when the measurement was made. The hand micrometer may again be applied, but merely to corroborate the operator's calculations.

The cuts over the sides of the wheel need extend toward the center no farther than is necessary to clear the sides of the channel or adjacent shoulders. Each successive cut should be rounded out roughly to meet the undressed sides of the wheel, as it is undesirable to leave a sharp internal corner in a wheel unless the contour being ground demands it. The rounding can be done by hand by combining the cross and traverse movements, the operator observing the progress of the cuts through the magnifying glass to be seen in Fig. 11 and succeeding illustrations.

Great care is necessary when dressing the side of a wheel to avoid too much side pressure. Sharp, finely-pointed diamonds should be used and cuts should be light.

The necessity for care increases as the thickness of the wheel decreases. To dress a wheel to a thickness of but 0.009 in. requires a deal of patience, even though the attenuated periphery projects but $\frac{1}{16}$ in. from the body of the wheel.

With a wheel dressed as above described, a channel of any width greater than 0.010 in. may be sunk in the hardened body of a form tool, but the method is not used for channels above $\frac{1}{4}$ in. in width, for the reason that such channels can be made to better advantage in another way, which will be considered later in connection with a concrete example of form tool grinding.

To dress a wheel to grind an angle intercepting a parallel surface at other than 90 deg., the wheelhead is first set to zero (accurate setting is now imperative) and the periphery of the wheel is dressed as above described. The wheelhead is then swiveled to the desired angle, presenting a corner of the wheel to the diamond, and the wheel is further dressed by traversing the table or by running the wheelslide in and out, according to the relative position of the angle on the work. With the wheelhead returned accurately to zero, the wheel will be in shape and position to grind the parallel surface at the same time that it grinds the adjacent angle.

Establishing Difficult Shapes

Often the exact point at which the angle intercepts the parallel surface is of importance, as when a comparatively narrow channel is to have one or both sides at an angle other than 90 deg. with a definite width of flat at the bottom. This calls for a shape that would be difficult if not impossible to measure on the wheel, but the point of interception may be determined mathematically and transferred to the wheel accurately through the medium of the micrometers and verniers of the machine.

Having dressed the periphery and sides of the wheel as described for a square-bottomed channel and noted the thickness with a micrometer caliber, the wheelhead is set to the desired angle. The stationary diamond is now traversed back and forth before the revolving wheel as the latter is advanced toward it until contact is established with the corner; a point that is determinable within a split thousandth, both visually and audibly.

The reading of the micrometer dial on the cross-feed screw is noted at the instant of contact, and the advance is continued (as is also the traversing movement) until the number of divisions over-run on the dial indicates that the wheel and diamond have "overlapped" a distance equal to the calculated height of the triangle represented by the material removed from the wheel. The overlapping portion of the wheel has, of course, been dressed off by the traversing diamond and the point of interception located upon the wheel with mathematical precision. To perform this somewhat delicate operation, a sharp diamond is necessary and there must be no vibration of the machine, but no competent grinder man needs to be told that vibration is fatal to accuracy on any grinding operation.

This method of establishing a point of departure from which to calculate further movements is called "touching," and is frequently employed during the wheel forming, and later during the actual grinding operations. Whether contact is established with the periphery or the side of the wheel, the diamond must be kept moving, and when the method is employed to establish relation between the wheel and the work, both must be running.

A white card is laid on the table directly below the point of contact so that the operator in looking through the glass above observes the approach of the wheel to the work against a sharply contrasting background. As stated above, a skilled operator will determine the actual contact within a split thousandth, while a novice may dress three or four thousandths off the wheel or grind half that amount from the work, as the case may be, before he knows it. It is one of the knacks that must be acquired by practice.

To form a radius upon a wheel, the fixture shown in Figs. 12, 13 and 14 is employed. Fig. 12 shows how the diamond is set to produce a rounded face upon the wheel, corresponding to a round-bottomed groove or a fillet in the work. Part *A* of the fixture swivels about a vertical axis, with the extended plane of which the inner face of the finger *B* is coincident when the slip-gage *C* is in the place here shown.

With the finger bar clamped and the diamond holder free, the operator introduces a gage block *D*, of the required dimension, between the diamond and the finger, adjusts the diamond to bear upon it and tightens the holder. It is obvious that the point of the diamond will now swing in an arc, the radius of which is equal to the thickness of the gage block, and when applied to a wheel will produce a round face of that radius upon it. The finger is, of course, drawn back out of the way when the setting has been completed.

To produce a concaved face on the wheel, three steps are necessary to set the diamond. First, the diamond is advanced to bear directly upon the inner face of the finger *B* and clamped, in which position its radius is zero. The slip-gage *C* is removed, the finger-bar loosened, and the finger adjusted to allow the gage block to enter between it and the point of the diamond. Fig. 13 shows the operation at this stage. Note that the slip-gage *C* has been removed from the finger bar to allow the finger to be advanced beyond the neutral point.

After clamping the finger-bar, removing the gage block

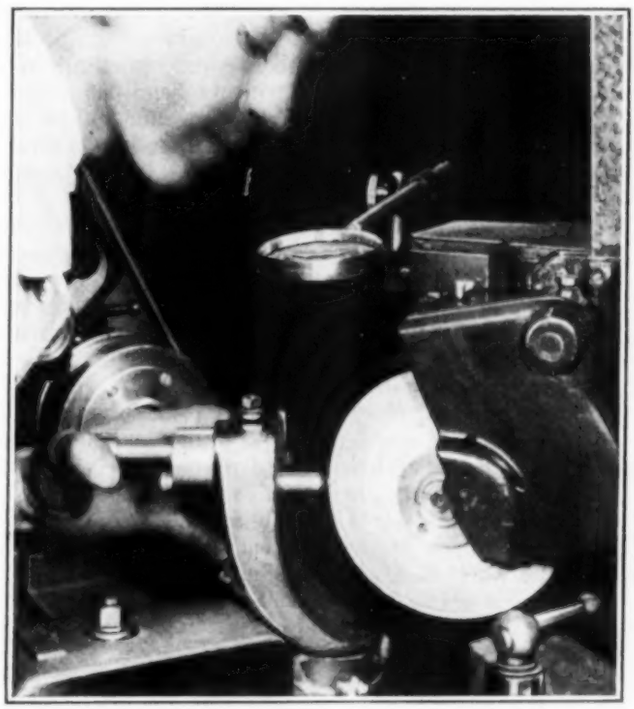


Fig. 14 — The diamond is set to fillet the wheel and the operator is observing the progress of the cut through the magnifying glass while feeding the diamond to the wheel by means of the cross-feed screw and traverse handwheel

and loosening the diamond holder, the diamond is advanced to bear upon the finger, in which position its radius is external and again equal to the thickness of the gage block. In Fig. 14 the operator has completed this setting and is filleting the corner of the wheel. The wheelhead may be set to present the wheel at any convenient angle for this operation. If, however, any other surface is to be formed at the same time, the setting must not be changed after the wheel has been dressed.

To produce a symmetrical round face upon the wheel, set the wheelhead to zero position and dress both sides

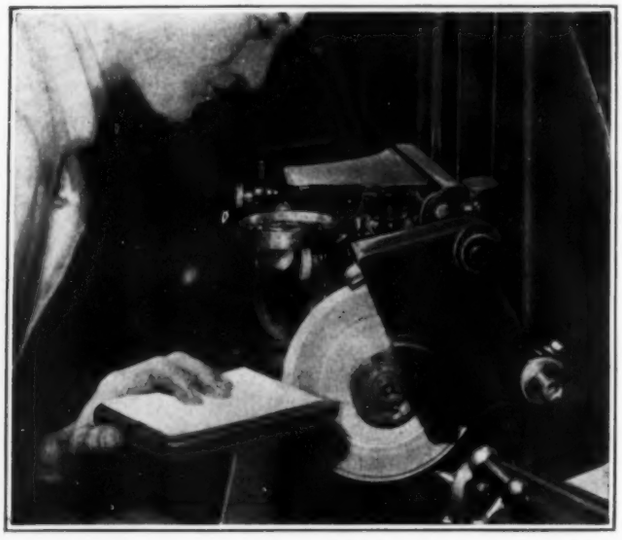


Fig. 15 — After a wheel is formed to a desired shape the operator verifies his calculations by cutting into a card and thus producing a templet to which he can apply micrometer calipers and gage blocks

of the wheel—disregarding the periphery for the moment —by using the diamond in the stationary holder. Make the thickness equal to twice the desired radius, measuring it on the stationary wheel with the hand micrometer. Set the radius truing fixture in place and adjust the diamond to the radius, swing the diamond holder parallel to the line of table traverse and touch the diamond against the side of the wheel.

Without moving the table, run the wheel back to clear the diamond, swing the holder 180 deg. and again advance the wheel. The point of the diamond should now just touch the opposite side of the wheel if all settings are correct. Run the wheel back and advance it once more while swinging the diamond from side to side, continuing the advance until the diamond cuts the full half-circle upon the periphery of the wheel.

To make upon a wider wheel a round corner to blend exactly with the straight lines of the periphery and side of the wheel, the diamond is positioned as before to contact with one side of the wheel and the reading of the vernier upon the longitudinal scale is noted. Running the wheel back and swinging the diamond 90 deg., the wheel is advanced until the diamond contacts with the periphery, when the reading of the micrometer dial is noted.

Wheel and diamond are now separated by running back the wheelslide or withdrawing the diamond by traversing the table, as is most convenient. Wheel or diamond is again advanced while swinging the diamond through an arc of 90 deg. until both the micrometer dial and the vernier again register the readings noted, at which time the point of the diamond will coincide with the side and the periphery of the wheel in its respective positions. There is an adjustable stop on the fixture to limit the swing to the desired arc.

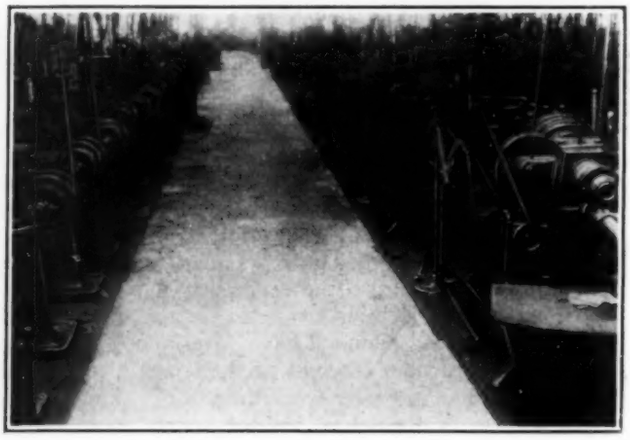
There is always possibility of error due to the human equation, and a careful operator verifies the shapes of the wheels before bringing them into contact with the work. A flat, or table, rest, having in one of its four sides a deep U-shaped notch to span the wheel, is secured to the table of the machine as in Fig. 15 with its surface adjusted accurately to the height of the work centers. A piece of heavy cardboard is held firmly upon the rest and the wheel is advanced, cutting its way quickly into the card and producing an accurate, easily measured templet of the shape it may be expected to transfer to the work.

How the forms produced upon the wheels are combined on the body of a circular form-tool will be considered in the next article.

Concrete Truckways in an Old Factory Building

A STATEMENT is credited to a prominent manufacturer of power-driven trucks and tractors to the effect that New England shops were not as a rule good prospects for his product, for the reason that the factory buildings were in most cases erected long ago when no such aids to production existed and consequently were not easily adaptable to modern shop transportation machinery.

While there is, no doubt, reasonable ground for such belief, the mere fact that a factory building was put up



A concrete truckway in an old factory building

fifty or more years ago does not necessarily preclude the adoption of modern methods if its management is up to date. In witness whereof the accompanying illustration shows a 6-in. concrete truckway, 6 ft. wide, down through the center of a building about fifty years old.

The truckway is one of many in the main plant of the Hartford Machine Screw Company, at Hartford, Conn. Not only are the main aisles concreted but they are intersected at convenient intervals by other truckways of the same construction. When the motorized truck had demonstrated its indispensability to modern production, the management of this shop rearranged its layout to dispose its machines in such manner as to take full advantage of this modern means of shop transportation, and laid down these truckways to reach all parts of the shop.

· THE · FOREMAN'S · ROUND · TABLE ·

The following narrative is a "case" presentation of the topic. It has been written to involve some of the questions that arise in the average shop. For guidance in preparing discussion the questions at the foot of the page have been prepared

Helping the Firm Make Sales

"SAY, Al, did you hear about how our friend Roberts was treated over at the Farwell Works?"

"Guess not, Ed, what was it all about?"

"Well, you know he is one of the best mechanics they have, and they sent him over to the Jones Coal Mine to erect a winding gear and engine that they had sold. While he was there the engineer told him that a pumping outfit was required at the next mine, so that night Roberts took it on himself to see the manager and gave him a strong line of argument and full particulars about the Farwell equipment. The manager had been almost sold on somebody else's pump and engine, but when he came over to the mine the next day and Roberts gave him a demonstration, he wrote out the order and sent it along with Rob."

"Guess the Farwell sales force was pleased, Ed."

"Of course the Farwell crowd was pleased, but trouble started when Rob asked for the 10 per cent allowed to salesmen. They told him they didn't pay their inside men commissions, and said it was up to him as an employee to boost the company's product all he could. So Rob went up in the air. What do you say to that, Al?"

"But aren't they pretty nearly right, Ed? Isn't the company right in expecting loyalty and co-operation?"

"Great guns, yes, Al! but can't he expect extra pay for extra effort?"

"Not in that way, Ed, as I see it. If Roberts hadn't gotten sore, but had continued to do the extra boosting, don't you suppose that his firm would have begun to realize that he was a valuable man, and have put him in a more responsible position with bigger pay soon? It isn't every good mechanic or foreman who knows his firm's product so well, and is capable of selling it. The fact is that most firms would be afraid to let the erectors interfere with sales for fear of messing up the business."

"Well, Roberts can't see it that way, and I rather agree with him, Al."

Was Roberts right in demanding a commission or should he have considered the work as part of his job of co-operation? How should such work be rewarded? Wouldn't it have been better for Roberts to have called in a regular salesman?

All foremen are urged to discuss these questions vital to their work; of course the

discussion is not limited to foremen. Letters accepted and published will be paid for

Discussion of Earlier Topics

Something Besides the Pay Envelope

GUESS I sort of side along with Al. Perhaps the most successful system is that of making it desirable and profitable for the men to purchase an interest in the concern. This making an employee into a stock holder has been very ably demonstrated by Mitten Management in building up the public transportation utilities of Philadelphia. It is certainly worth a considerable sacrifice of immediate gains to provide an opportunity for the employees to buy stock on an installment basis and at a price below the public market value. It's a lot different when you are a "boss," and the proper handling of the executive function can certainly convince every stock holding employee that he's an owner, with an owner's interests to protect and profits to increase. The number of petty leaks that will disappear, the speeding up on each job, the waste elimination, the good will co-operation, in fact the "company spirit" that replaces the "selfish spirit," are truly remarkable.

—S. R. BREWER.

AN EMPLOYEE'S magazine helps to create an interest among the men in a concern, since it is human nature to like an illustrated article on work which has been done by them. Furthermore, publishing the most beneficial suggestion offered during the month would cause the men to do some serious thinking along constructive lines, and make them more alert to the possibilities at hand.

—A. TOMLINSON.

Promoting Interest Among the Boys

THE foreman should have a large part in the program of instruction of apprentices, and his work should be supplemented by meetings presided over by men who are capable of presenting in detail some particular phase of manufacturing and a discussion of the things that are being handled. In any case, the boy should be given a chance to ask questions. The mistake is sometimes made in a meeting of this kind of telling the apprentices that they are eligible to become executives, while the details of the job that they are engaged upon are neglected.

—JOHN MARK MAY.

A FEW minutes' talk after working hours is sufficient to discover the cause of the lack of interest among the men and introduce a remedy. The most effective way to create interest is through the pay envelope. After all he is working for a monetary consideration, and not for the sake of pleasant working conditions. Social work by the firm helps to create and hold good-will, but an interest in the work is created when the worker knows his efforts are being appreciated. When a man becomes interested in his work it frequently becomes his amusement as well and he works at it with unremitting industry.

—H. KAUFMAN.

IT IS evident that if such an effort is made to stimulate interest, the men of the shop will come to the conclusion that they are indispensable, and they will become hard to manage. As a consequence, when their services are most needed on a rush job, they will balk and will not show the proper spirit of co-operation. Proper interest comes from doing work carefully and in proper quantity. Mechanics that do not produce probably have no interest in the work, and so they should be discharged.

—PETER HAGEN.

Helping Tony Celebrate

THE sincerity of Al's intention cannot be questioned, but I think his actions did not show much intelligence. To permit the men themselves to wear an appropriate flower on a holiday is, of course, a fair and sensible thing to do, but the joining in with the celebration, and becoming one of the men are things that I question. Al represents the management, and as such should take no official part in this holiday which has nothing to do with either the business or the nation. The important result of the whole matter is not whether Al can go too far in this direction, but rather how far the men, in their enthusiasm, will think he has gone.

—GUY A. GRUBB.

EVEN if Al's Italian workmen have taken out naturalization papers, and have every intention of becoming "all wool" American citizens, there is no reason why they should not continue to cherish some of the customs of their native land. As a rule the man who has a deep and sincere love for his homeland has more stability of mind and character to make him a better citizen in the land of his adoption than the irresponsible chap who is satisfied with any environment.

—E. R. PLAISTED.

THE · NEXT · TOPIC

Vacation as a Bonus

ADVANCE QUESTION

Vacations are beginning to be considered as a necessity. Should they be optional with a cash bonus? Or can they be given for special service without interfering with regular work?

The entire training program, as to plan and purpose, is designed to aid in making better workmen and to develop a better understanding of the company's products and of their manufacture

What's the best way? This class in foremanship training is trying to answer that question concerning a number of its problems

"Armco" Training Activities

By V. E. Cribbs
Supervisor of Training
The American Rolling Mill Company

ALL OTHER things being equal, the man who studies his job, whatever it may be, is the man who makes satisfactory progress, both from his own standpoint and from that of the company for which he works. With this in mind, and to provide the means whereby men might be directed and aided in purposeful study, the training department of The American Rolling Mill Company was organized some ten years ago.

From its inception it has been the aim of those in charge of the department to carry on such courses of study as would fit the needs of all classes of employees and of all divisions of the organization.

With the exception of a few of the more technical subjects, where a knowledge of the fundamentals is necessary, the only requirement to entrance in any course is a desire to learn. The wide range of subjects covered in training activities gives every man an opportunity to take advantage of one or more courses that may be of particular interest or value to him. It should be emphasized here that the application of the subject covered to the man's job is kept in mind, and to that end the members of the training department are frequently called upon to advise applicants as to what course it would be best for them to pursue. It is certain that a machinist can secure more practical benefit engaged in the study of mechanics than he could were he to spend his time studying accounting, shorthand, or business letter writing.

All class work is carried out in the evenings, each class meeting once a week for a period of from one to two hours. Courses may vary in number of meetings from six to forty or more depending upon the subject to be covered, and the extent to which it is gone into.

The courses of study offered may be divided into two classes, general and specific. The organization of all classes is handled by the training department staff. Before the general classes are started, usually in September, all plant foremen are supplied with enrollment cards, on which are listed the subjects offered. Men interested in entering classes are encouraged to consult the foremen, who help their men select the course that is deemed most practical. The cards, properly filled in with the man's name, department, and the subjects chosen are returned to the training department. The applicants for the various classes are listed and each man is notified when and where his classes will meet. Blueprint reading, economics, metallurgy, mathematics, public speaking and other courses of a similar nature are termed general classes, and the enrollment is secured in the manner described.

The organization of specific courses presents a different problem. But comparatively few men would be interested as, for instance, in the case of a class in metal-

lography. The most expedient plan is for a member of the training department to call upon the various men who might be interested, explain the course and so secure the enrollment from only those who can make practical use of the study.

The matter of choosing instructors is one of great importance. Some thirty are on the staff at present, mostly men chosen for their particular qualification along the lines of the courses they handle. The class in electricity, for example, is handled by one of the plant foremen who has charge of certain electrical work and equipment. Likewise, the course in open-hearth practice is headed by the open-hearth superintendent who understands the practical value of all subject matter covered during the study. These instructors are paid for the time they spend in preparation of material as well as for the time devoted to classwork. Whenever advisable, personal attention is given by the instructor to the individual members of the group, as in the case of the welding class, where actual demonstration of the work must be given. The various courses covered by the training department activities may be grouped under four general headings: plant classes, technical classes, commercial classes, and special classes.

Every organization has some men who would be better workmen if they were a little more efficient in figuring. These men are studying applied mathematics

The plant groups cover such subjects as open-hearth practice, gas making, cold rolling, welding, blueprint reading, drafting, electricity, practical mechanics, and foremanship. Instruction in every class is of a practical nature, with a view of giving to each man something that he can apply on his job. Frequently these classes meet in the plant where the instructor in charge can go into detail with the equipment or material under discussion. In general, however, the classes are conducted on a discussion basis where every man is encouraged to express his ideas and opinions. These free exchanges are invaluable, in that each man learns how the other fellow goes about the same problems in the same kinds of work, thus all benefiting from the aggregate of experiences and knowledge.

The technical classes, covering metallurgy, metallography, chemistry and allied subjects, are conducted more along the lines of class-room procedure. The personnel of these groups is made up largely of college graduates who are eager to secure information about the technical end of the iron and steel business. The class work is devoted to the study of the best textbooks available and, in addition, reports are required, investigations conducted, and research encouraged along the line of study. Here, as in all courses, the practical application of the work is kept in mind.

Our commercial classes, covering typing, shorthand, business English, letter writing, accounting, commercial law and economics are all conducted in the training department building. These classes meet regularly in the evenings, in charge of competent instructors.

The commercial groups are so divided that each student can take up work that fits his needs. In some instances individual instruction is carried out, particularly in accounting or business letter writing where each student progresses at a different rate. Commercial law and economics are carried out by the discussion method.

In addition to the evening commercial classes, a regular co-operative commercial class is conducted during the day at the training department for girls who want to qualify for responsible office positions. Class room instruction in the morning is co-ordinated with employment in the offices in the afternoon so that the training period may afford a maximum of progress in a minimum of time. In all class work the illustrations are company illustrations, and the problems are company problems; in short, all work covered is made to simulate actual conditions found when in regular employment at the office to which the girl is assigned at the completion of her course.

The commercial division of the training department usually has ten or twelve girls who not only are preparing themselves for good positions but also constitute an emergency squad to take care of peak loads and to substitute for absent office employees.

The training of salesmen is one of the most important functions of the educational department. Men who are selected by the sales organization are given an intensive training and education. The length of the course varies from three to ten months, depending upon age, previous experience, and the type of sales work that is to be given the individual. The course carries each man through all departments in the mill. Here he makes a detailed and comprehensive study of the various manufacturing processes, and learns first hand how "Armco" ingot iron and all other company products are made.

Periodic reports and oral examinations are required as a means of measuring his progress. In addition to his work in the mill he carries out a course of study at the training department, designed to correlate his practical experience with future problems. Salesmanship, sales metallurgy, a study of contracts, and business letter writing constitute this study course. As a result of this careful and comprehensive procedure, when a salesman of The American Rolling Mill Company sells this company's product, he knows about it technically and can discuss its merits intelligently.

Believing that the salesmen of our large distributors should have the advantage of more information with

respect to our products, the training department started customer salesmen's classes seven years ago. Groups of from six to eight salesmen are brought in for a period of one week. The program includes lectures by different members of the organization and a study of the manufacturing processes. Even though many of these men had been selling iron and steel products for years, prior to their week's work in Middletown, they had never been inside a steel mill. The advantage of such a week's experience cannot be overestimated, and very definite and concrete results have been obtained in an increase in sales after these men returnd to their respective territories. Over 350 customer-salesmen have spent a week or more studying "Armco" products and processes as outlined.

Twice each year classes are conducted in citizenship for those people who wish to become citizens of the United States. These classes are not restricted to our employees; all foreigners in the city are given opportunity to enter. Instruction is carried out in history, the Constitution, and allied subjects, to enable the applicant to pass the rigid examination required for admission to citizenship. The training department also aids in the many details incident to securing citizenship. A kindly and sympathetic attitude and a willingness to aid are met with deep appreciation on the part of our foreign-born workmen.

In an organization as large as ours it is frequently found that employees of one department know little or nothing of the work done in other departments. In order that every man may be given the opportunity of learning what is being done elsewhere in the mill, classes are frequently organized to study each department and process. These groups are known as "Armco" products classes and cover one study period a week for ten weeks. Each study period is devoted to the study of a department with an explanation, usually by the department superintendent, of the functions, processes, and products of the division under study. Without question, through this study, a greater appreciation of the part played by all departments in the successful functioning of the entire organization is gained by all who have gone through this course.

The plan and purpose of the entire training program are to aid in making better workmen and to develop a better understanding of the company's products and of their manufacture. The accomplishment of such a program will bring about the desired result which can be stated briefly and concisely—an increase in company profits.

The Value of Research to the Present Day Manufacturer

By Dr. C. E. Skinner
Assistant Director of Engineerg,
Westinghouse Electric & Manufacturing Company

THE terms "industrial research" and "industrial research laboratory" have come into general use only within the comparatively recent past. We had laboratories and experimental departments twenty-five years ago, but research, as the term was understood, was mainly confined to a relatively few university- and government-operated laboratories. Prior to the Great War, we had organized in the United States quite a number of industrial research laboratories, some of them already operating in a very large way. The war and related developments have given a very considerable impetus to the establishment of research laboratories in many and varied lines of industry so that the growth of industrial research has been very rapid since that time. It may seem strange to some that in the beginning of the industrial research era, the newer industrial plants were largely the ones that established and operated extensive research programs. This situation is easily explained by the fact that these newer industries are very largely founded on the results of fundamental scientific research, and they found it necessary to continue research for further development, and for the control of their materials and processes. The electrical industry, for example, is hardly half a century old and yet within this industry may be found some of the oldest and most extensive industrial research laboratories of this country.

The enormous strides which have been made in those industries that have inaugurated and carried out definite and systematic research programs, have no doubt had much to do with the present-day sympathetic attitude of almost every industry in the country to the question. This has resulted in a very rapid increase in the number of research workers in nearly every branch of industry. The larger manufacturers are in the main carrying on programs of research within their own organizations while many smaller manufacturers have a nucleus of research workers or have combined in co-operative research programs.

The latest census available indicates that we now have in the United States upwards of 1,000 industrial research laboratories with well over 10,000 trained research workers. No accurate statistics are available giving us the annual expenditure in this country for industrial research, but this runs into many millions of dollars, and a number of individual laboratories have budgets of a million or more dollars per year. These are very impressive figures and answer the question very definitely as to whether research is of value to the present-day manufacturers.

We are mainly concerned with the value of an organized commercial research laboratory operated in connection with and for the benefit of a manufacturing business. Notable individual contributions will undoubtedly be made in the future as in the past, but for their development and use, the modern industrial research laboratory will play a major part.

Industrial research intelligently directed and applied, is of value to the present-day manufacturer; in fact, it is essential to his very existence. This is true whether it be undertaken for any one or for all the reasons, which may be summarized as follows: To cure trouble; to anticipate and prevent trouble; to improve the quality of materials or products; to develop new processes, materials or products; to develop new uses for existing products; to effect savings; to abate nuisances; to develop new products to meet an existing market or to create new markets; to assist in standardization; to aid in perfecting new materials or devices; to develop better customer and public relations; and last, but not least, to add to the sum total of human knowledge, which not infrequently results in material and cultural advances of the most profound import to all mankind.

Abstracted from an address presented before the American Gear Manufacturers Association, Rochester.

Dies
for Calculating-Machine Parts

By Fred H. Colvin
Editor, American Machinist

CALCULATING machines, typewriters and similar mechanisms afford many excellent examples of the blanking and forming of sheet metal parts. The large quantities of parts used and the accuracy necessary to secure satisfactory functioning of the mechanism, makes the experience of the manufacturing of such machines of particular value. The examples shown herewith are from the plant of the Monroe Calculating Machine Company, Orange, N. J., and the dies and methods are the result of a careful and painstaking attention to details that involve the accuracy, production, first cost and maintenance of tools and equipment, as all of these factors affect economical manufacture.

Experience, in this case at least, points out the wisdom of designing simple punches and dies rather than in combining too many operations in a single tool. The first cost, the delay in production when even a minor defect occurs, and the cost of sharpening and otherwise maintaining complicated dies, indicates that it is frequently better to use more operations and the more simple tools. In this connection it may be well to state that the company referred to has found the use of a jig boring machine a decided factor in reducing the first cost of dies.

One of its die practices is somewhat unusual. The last few pieces of the run of any punching or forming die-set are not put into the lot, but go with the tools back to the toolroom. With these last pieces before him, the toolmaker can form a very accurate opinion as to the condition of the dies and the amount of work that must be done upon them to put them in shape before they are put back on the tool shelves for reissue. Not only can the sizes of the pieces themselves easily be checked, but also the condition of the cutting edges of blanking or shaving dies, and of the shape and surface where the material is bent or formed. The practice has much to recommend it. Among the important pieces of the calculating machine are the carrying check pawls, one of which is shown in Fig. 1. The parts are cut from a strip that is fed through the die twice, the second time in a reverse position so as to save stock by overlapping, or nesting as in Fig. 1. First, the two holes are punched by the punches, *A* Fig. 2, these holes coming under the guide pins, *B* in the second position when the pawls are blanked from the strip, as is common in blanking with a progressive die.

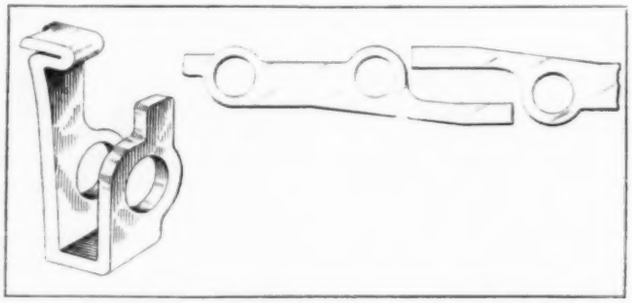


Fig. 1 — An outline of the carrying check pawl and the way in which it is nested in blanking so as to save stock. One blanking die is used, two passes being necessary

Following the blanking, the pawls go to the bending die at the right where two of them are bent at each stroke of the press. The pawls are located and held in position by round-ended guide pins that fit in the two holes, as at *C*. As the punch descends, it bends the ends into Vs as at *D*, ready for the final closing or upsetting operation in the die shown in Fig. 3, at the left.

Here again the pawl is held by similar guide pins with the bent ends resting in a suitable recess. The upsetting is done by the block *A* when it is forced against the end of the pawl by the wedge *B*. Before this block begins to act, however, the pawl is held firmly in position by the spring pressure-plate *C*. The result is the closing of the V into a square foot, or end, as at *D*, and as shown in Fig. 1. The final operation is the bending of the pawl in the die at the right, so as to bring up the ends and align the holes, as shown at *E*. The pawl is located by its two bearing holes as in the previous operations. The material is soft cold-rolled steel, 0.072 in. thick. The pawls are carburized and the points are hardened and ground to proper shape and dimension.

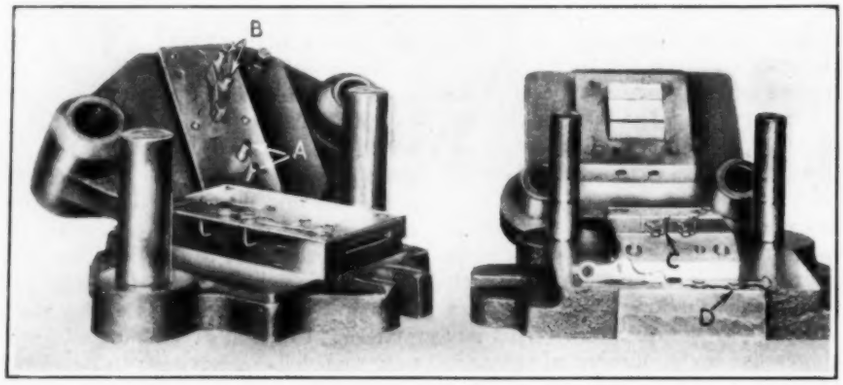


Fig. 2—Tools for punching and blanking the pawl and for bending the end as a first operation in upsetting the end. The second die bends two pawls at once, the pawls being located by round-ended pins in the two holes. The ends are bent into Vs as can be seen at D

Selector bars are also pieces that must be accurate and are ones that must be varied according to their places in the machines in which they are used. A complete bar is shown in outline in Fig. 4. All selector bars

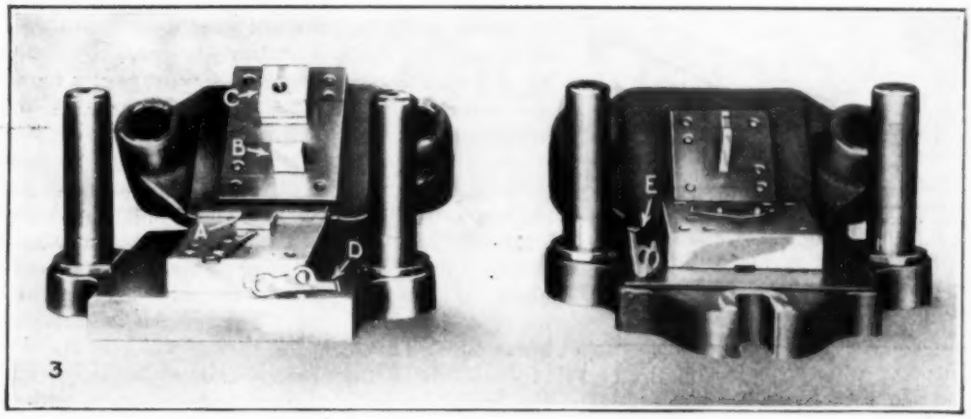


Fig. 3—Dies for upsetting the end after the preliminary bending, and for bending the whole pawl so that the two bearing holes come in line. The blank is located by the pins shown, their conical tops permitting the blank to draw off easily as the punch descends

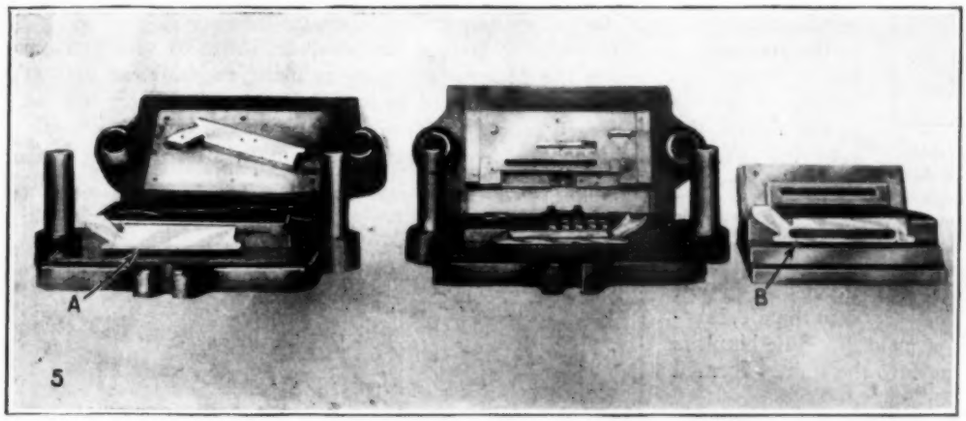


Fig. 5—Three of the dies that blank, notch and press-in the main reinforcing rib. The bulge on the bottom of the blank is to allow enough metal for forming the reinforcing rib without stretching and thinning it

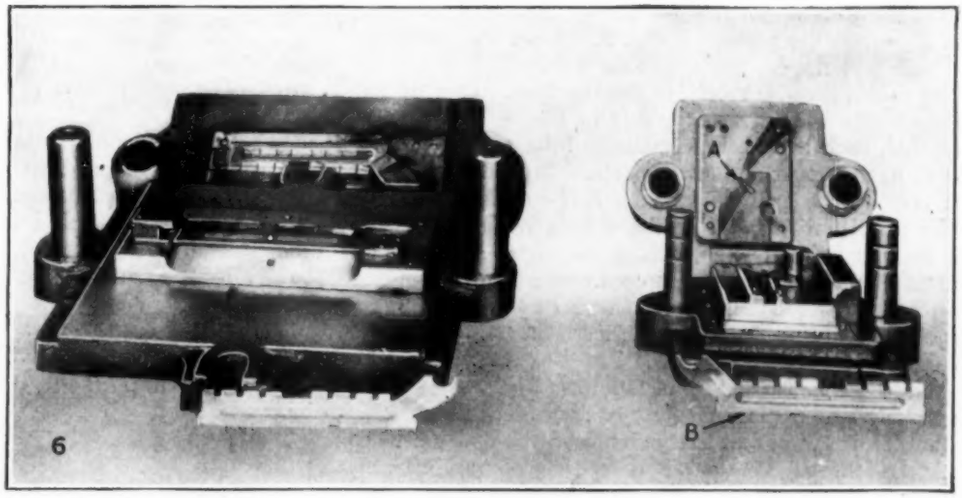


Fig. 6—Dies that bend the teeth in the selecting bar to the proper angles, and that raise the short reinforcing rib in the angular portion of the arm at the bend. The bending dies are sectional

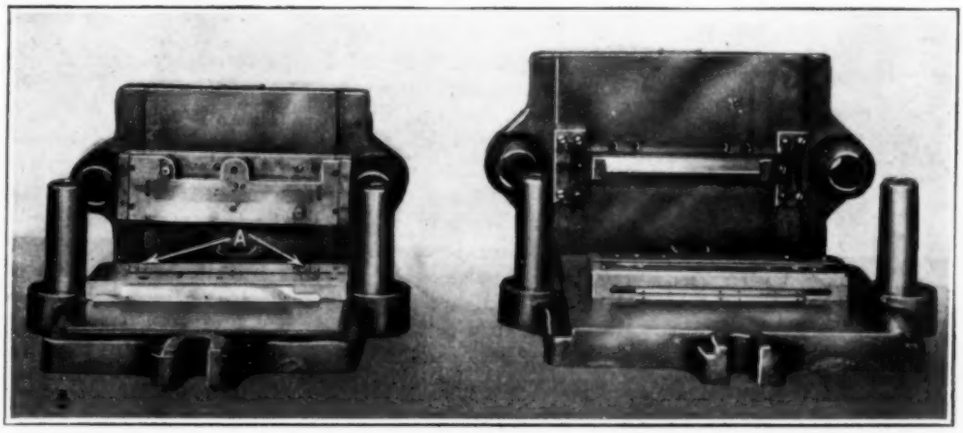


Fig. 8—Piercing and bending dies for the locking shutter. This part is first blanked and the blank is then located by means of the small pins shown at each end. The bending die at the right simply forces the piece into a V-groove in the lower die

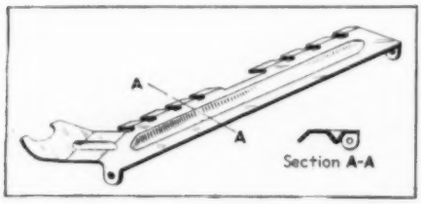


Fig. 4 — Selecting bar for a calculator. The reinforcing ribs and the different angles of the various teeth make an interesting problem for the tool designer

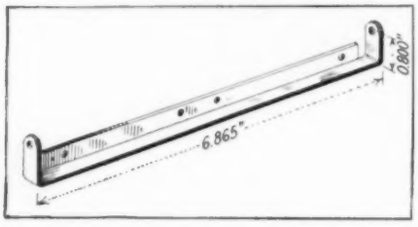


Fig. 7 — An outline of the keystem locking shutter. This piece is but 0.040 in. thick. It is made of quarter-hard cold-rolled steel and is not case-hardened. The holes in the ends are punched after bending to insure accuracy

are made from the same blank, as at *A*, Fig. 5, but the notching and some of the subsequent operations differ according to their positions in the machine. It will be noted that the blank *A* has a bulge on the lower edge. This is to allow for the metal to be drawn into the reinforcing rib, in the shape of a fairly deep V-notch, as shown at the right. By relieving some of the pressure from this edge of the die, the metal in the bulge is drawn into the die, leaving the bottom practically straight as at *B*. The blank is located by its rounded ends fitting into the guides formed by the small pins at each end.

Following the forming of the stiffening rib, the required number of notches are cut by dies similar to the one shown in the center of Fig. 5. After the notching, the different fingers must be bent to varying angles in order to function properly in the machine. One of the bending dies is shown at the left in Fig. 6 This die is sectional, each bend being produced by a special pair of blocks in the upper and lower parts. This die also offsets the end of the arm having the half-round notch. In order to stiffen this end of the arm, a rib is formed in the angular offset by the tools at the right. The punch shown at *A* forces the metal into a corresponding depression in the die. The result can be seen at *B* which also shows the varying angles of the teeth on the upper edge of the bar.

While the keystem locking shutter, Fig. 7, is a comparatively simple piece, it must be accurate. Blanking is a simple operation and the punching of four small holes near the long edge is done in a separate operation in the tool at the left in Fig. 8. The rounded ends of the blank fit between the small guide pins *A*, which locate the piece for the punching operation. The piece, with the four holes punched, can be seen in front of the die. The end holes are punched afterward.

Locating the blank by the punched holes, the piece is then bent at right angles along its length by the tools at the right. The punch is V-shaped and carries the blank down into the die, leaving a right angle bend as shown by the piece in front of the tools.

Both ends are then bent up as shown at the right in Fig. 9. The blank is positioned by the punched holes, and the punch forces it down into the die, bending each end at a right angle. In order to insure accuracy, the holes in the ends are punched after the piece has been bent. The piece is located over the blocks *A* and is held by the spring plungers *B*. Plungers *C* have the ends at an angle and, while plungers *B* are holding the work, the angular ends contact with the beveled ends of the punches *D* and force them through the ends of the work at the proper place.

In order to reduce first costs and also to save storage space, the Monroe company is using combination dies in many cases. Instead of having a separate punch and die for each length of front plates for the cover case, for example, the combinations shown in Fig. 10 are used.

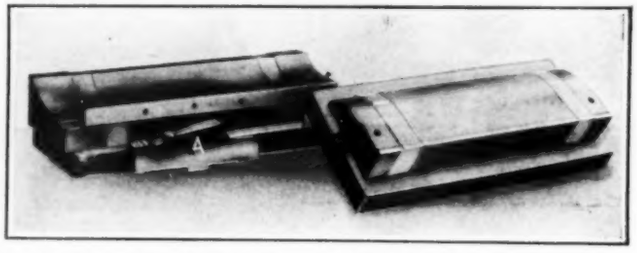


Fig. 10—A method of "stretching" forming punches and dies so as to handle work of various lengths. The dies are of close-grained cast iron with filling pieces of soft steel. The method saves cost and storage space

The cover plates being of sheet aluminum, a close grained cast iron makes a very satisfactory material for the tools and is less expensive to machine than steel. The insertion strips, however, used to "stretch" the tools to another size, are of soft steel. Tongues on the bottoms of the extension strips and a corresponding groove in the bottom plate, make it easy to assemble the strips into any length needed for the next job. The extension strip at *A* belongs to another die but shows what the strips look like when not in position.

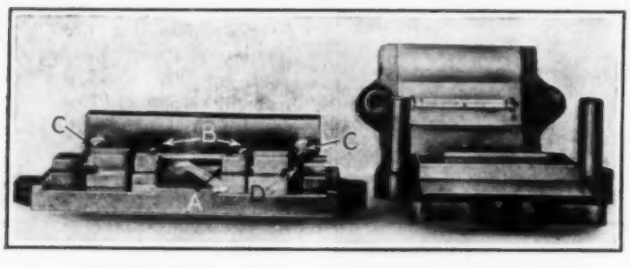


Fig. 9—Bending the ends and piercing after the bend. The piece is clamped in the piercing die by means of two spring plungers, after which the bevel-ended plugs force the punches through the ends in the correct location

Keeping Machines Running

By Samuel Kauffman

THE writer has in mind a plant where hundreds of machines are running, yet very little time is lost on account of breakage, this being due to having frequent machine inspection. Here the only time a machine is out of production is when the breaking of a part or casting puts it out of commission until the part is replaced. Each machine hand has an oil can handy—it isn't an empty one, either—and as he depends on the constant running of the machine for his daily bread and butter, he takes good care to oil it regularly. Minor repairs or adjustments, which the operator may report as being necessary, are made during the lunch period. Repairs which would take longer than that are usually made by the night gang.

Railway Tools and Devices from a Southern Shop

By Frank W. Curtis
Western Editor, American Machinist

Miscellaneous chucking devices used in turning tires, valve-packing, bull and piston rings—A journal roller and a home-made sheet-metal shear

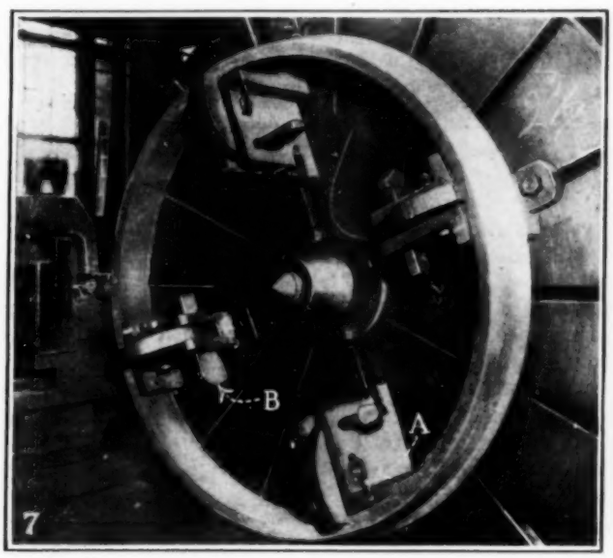
AMONG other labor-saving devices used at the Birmingham, Ala., shops of the Southern Railway System, are several chucking fixtures and set-ups for turning cylindrically-shaped parts. Locomotive tires are turned in a lathe, equipped with four jaws equally spaced on the faceplate as illustrated in Fig. 7. Each jaw consists of a heavy forging to which is fitted and pinned a steel clamp. The tire rests on hardened plates attached to the flanged portion of the jaw body, while two setscrews, as at *A*, centralize the tire on the faceplate. The clamp is tightened against the work by the tapered wedges *B*, which fit through elongated holes at the inner portion of the body. The hole in the body, through which the clamp pin fits, is likewise elongated to enable the clamp to be withdrawn sufficiently for the removal of a tire. Different sizes of tires are accommodated by moving the jaws radially on the faceplate.

An expanding fixture for holding valve packing-rings while being faced is shown in Fig. 8. A tapered plug, fitted to the central stud and having a hexagon head, expands four jaws that grip the work from its inner face. Two $\frac{7}{16}$-in. toolbits are used to machine both faces of the ring at the same time.

An expanding chuck of similar design, having four sliding chucking sections operated by a tapered plug, is used in turning bull rings as illustrated in Fig. 9. This fixture, however, is made to enable the work to be faced on both sides as well as to be turned. At the lower left may be seen the name of the operator which is the practice carried out on all machines. Some of the advantages of this plan are, that operators take more pride in keeping their machines clean; that an operator can be located more easily by name than by number; and that the operators learn each others' names sooner, which aids somewhat in spreading a more friendly feeling among them.

Piston rings are turned from a pot casting in a boring mill as shown in Fig. 10, the diameter of the rings illustrated being 28 in. Seven grooving tools are mounted in the side head which size the width of a similar number of rings at once. The operation is handled by first rough and finish turning the outside diameter and rough boring the inside diameter, and then grooving to within $\frac{1}{16}$ in. of the bore. The final cut is the finish boring which

Conclusion of the article.



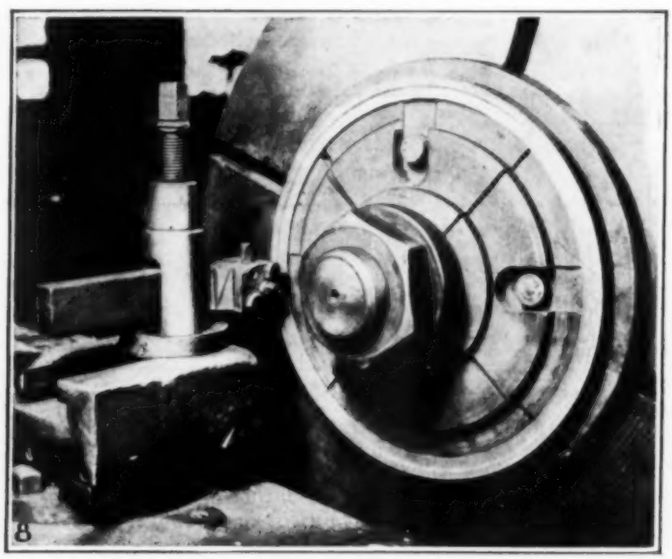


Fig. 7—A locomotive tire set up for turning the tread and flange. It is held by four jaws that consist of a body and a pivoted clamp operated by a tapered wedge. Elongated holes in the body of the jaws permit the clamp to be withdrawn sufficiently so that the tire can be removed. Tires of different sizes can be held by moving the jaws radially on the faceplate. Fig. 8—Valve packing-rings are turned in a lathe equipped with an expanding fixture that has four jaws operated by a tapered plug. The toolholder is equipped with two tool bits enabling both faces to be machined at once. Alignment is obtained by setting the machined face against the fixture

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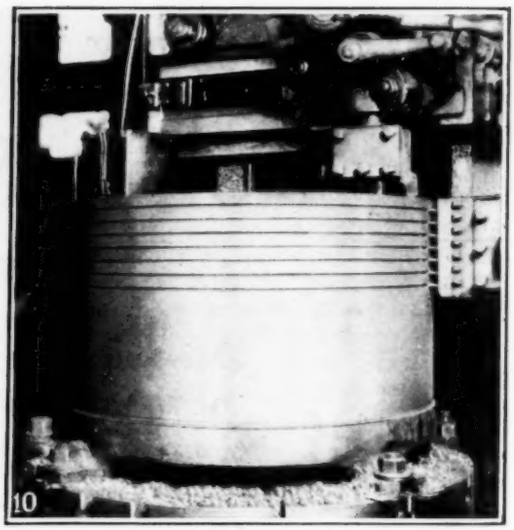

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Fig. 9—An expanding mandrel that holds bull rings enabling the work to be faced on both sides and turned on the outside diameter. A metal sign attached to the tailstock of the lathe bears the name of the operator, this practice being followed for all machines. It assists in locating an operator and enables the men to learn each other's names readily which has a tendency to spread a friendly feeling throughout the shop. Fig. 10—Piston rings are machined from a pot casting in a boring mill equipped with a grooving head that holds seven tools. The tools are fed within ⅛ in. of the bore and then the finish boring operation separates the rings from the casting. This feature prevents the leaving of a burr on the inside of the ring when the rings are severed from the pot

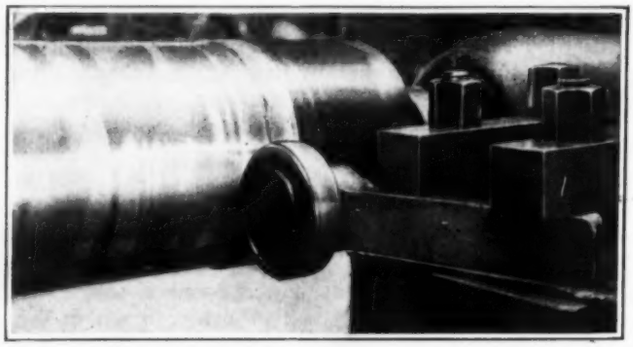


Fig. 11—Axle journals are finished by means of a rolling tool made from a ball bearing. A tapered plug held in the tool shank forms the inner bearing and permits of adjustment to compensate for wear

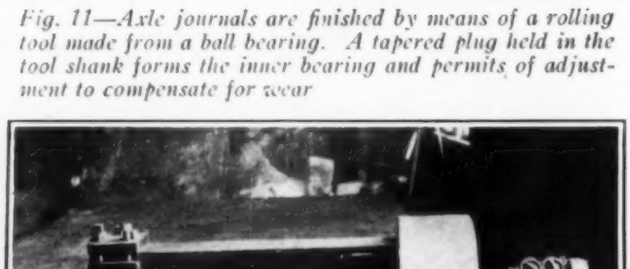


Fig. 12—Sheet-metal fittings, such as jackets, bands and tire shims are cut to size in the home-made shear illustrated, which is driven by an air motor. The shaft, to which the driven roll is attached, is operated through reduction gearing located in the housing at the right. An adjustable gage is provided to assist in guiding the sheets

separates the rings from the casting, thus eliminating the burr left on the inside when the grooving tools are made to pass through the entire thickness of the rings. From 17 to 21 rings are machined from a pot, depending upon their size and width.

The rolling tool for axle journals illustrated in Fig. 11 is made of a Timken ball bearing mounted on a steel shank. The inner bearing made of hardened and ground steel, is tapered slightly and is drawn on the shank by a nut on the opposite side of the holder. This construction permits adjustment to compensate for wear and enables the outer race to have a rigid support at all times, which is an essential requirement. Oil is applied to the surface of the work to assist in obtaining a smooth finish.

A home-made sheet-metal shear driven by an air motor is shown in Fig. 12. It is used in cutting out such parts as jackets, bands, tire shims, and miscellaneous sheet-metal fittings. The driven roll is attached to a shaft that is operated through reduction gearing located within the housing at the right.

Substitution of Steel Castings for Cast Iron in Machine Tool Construction—*Discussion*

By A. F. Davis

I AGREE thoroughly with Mr. Hart in his statement in Vol. 68, No. 15, but why not take one step further? We know that rolled steel has characteristics vastly superior to those of cast iron, and, in general, that rolled steel of one shape or another can be fabricated to replace many of the gray-iron castings in use today.

Mr. Hart suggests the use of steel castings in the place of gray iron, which is certainly a step in the right direction; but the same results can be accomplished through the use of rolled steel shapes at vastly lower cost.

The growing "air-mindedness" of the average citizen is indicated by the incorporation of a large company to develop airports in different localities and to link them together in a sort of chain-store management. It is believed that by such development the airports can be made of greater service to pilots and transport companies, and that operation costs can be reduced.

THIS BUSINESS OF BUYING

and the Trouble With It

By Earl Whitehorne

Assistant Vice-President, McGraw-Hill Publishing Company, Inc.

EXECUTIVES of American industry realize today that they have made a serious mistake through the last quarter century. They have allowed themselves to become so absorbed in the problems, the achievements and the fascinations of production that they have neglected distribution. Our methods of distributing our goods have grown by main strength and awkwardness.

Something else has been happening that has not been generally noticed. This tremendous increase in production has brought with it an intense pressure on sales. The growing output of the factory — everybody's output—has been driving the salesman to desperate ingenuity. And American industry has also become so engrossed in selling that it has neglected the efficiencies of purchasing. The world has honored and courted the salesman while the purchasing agent has gone his way unseen and unsung. And yet for every sale there must be a purchase and the practices and the policies and the principles of the man who buys have as much influence upon the success of the transaction as the methods and the motives of the man who sells.

> "Price cutting today is due more to the folly of the seller than to the cupidity of the buyer, and the seller will have to provide his share of the reform. He always has the power to refuse to sell. He can control the price at which he himself sells, if he is willing when necessary to sacrifice volume for profit."

The time has come, therefore, to turn some thought upon this business of buying that has so much to do with whether sales are profitable or not. We have got to throw the searchlight on the present status of the purchasing function in industry just as we have got to study and reform the process of distribution in this country.

For we have reduced our manufacturing to a science. We think in terms of B.t.u.'s per lb. of coal. We invest thousands of dollars in machines that will make possible the continuous saving of a fraction of a cent. We select and organize our labor and support each operation with four and a half horsepower. We govern the very motion of a man's hand. Yet we do our purchasing too often "by guess and by God," we sell at whatever price will get the order and we deliver the goods by an overgrown mechanism of distribution so cumbersome that it often costs more to get the shipment into the customer's hands than it costs to manufacture.

In other words, while we pour science and efficiency into our production we proceed with the selling and the buying of these commodities that we have so zealously and skillfully produced, by a system so hit or miss that as soon as we get into a buyers' market, the sellers start cutting prices and the purchasers begin to profiteer and there is a general warfare between the very men who must depend upon each other for the conduct and prosperity of business. And so today we have many branches of industry very much exercised on the prevalence of price cutting with nobody knowing just what to do.

Well, what should be done? One thing is certain, that there is no general cure-all for price cutting—no panacea that will save the world. The only sensible approach that I can see is to examine into the causes and see if any common-sense corrections can be found. Obviously there are two causes —what the seller does and what the buyer does. The seller in a buyers' market becomes afflicted with overproduction. This brings on an acute attack of volumeitis and pressure is put upon his salesmen to get orders. At the buyer's doorstep his salesmen meet other salesmen who are suffering from the same anxiety. Some of them are armed with the weapon of cut price. To get orders, to get volume for the factory, they have been told to sacrifice the profit. They do. And when one does, many do. And this induces a kind of hysteria, a state of mind that is just a form of fear. It is price cowardice. It is a kind of mob psychology that will sweep right through the salesmen of any branch of any industry.

There is only one thing that cures this kind of demoralization. If the salesman's boss possesses the intestinal fortitude to control him and to lead him out of his fear it can be stopped. Otherwise it runs its course till it ceases from exhaustion.

It is a simple thing—price courage. When a manufacturing company enters the market with a line, its officials set a schedule of prices based on their costs which in turn are regulated by competitive conditions. If the president of that company will permit his sales manager to come in and talk him into authorizing a price cut to get some big order and the salesmen find it out, then the salesmen will everlastingly be importuning the sales manager to let them cut to meet another bidder on this job and that. But when the sales manager knows that the president has price courage, that gives him the guts to stand up against the salesman. And when the salesman knows that the sales manager also has price courage he

This article, which concludes a series of discussions by Mr. Whitehorne on the very pertinent problem of price cutting in industry, was presented as an address before the recent annual convention of the National Association of Purchasing Agents.

will battle with the buyer and refuse to telephone the office and ask for a better price.

To put it flatly, the salesman who believes in his boss carries price courage wherever he calls. Price cutting is not the salesman's fault. It is the fault of the executive who can not face the fact that the only relief in a market demoralized by over production and price cutting is reduced production. It is the fault of the executive who lacks the pluck to reduce his output rather than sell at a loss.

Industrial America at present is volume mad. But manufacturers will ultimately have to face the economic law that to sell at a loss is waste and an offence against industry. And when prices fall below cost they will have to accept their individual responsibility to curtail production as their contribution toward restoring the market to a balance.

This sounds very idealistic. But price cutting today is due more to the folly of the seller than to the cupidity of the buyer, and the seller will have to provide his share of the reform. And, of course, he can—for he always has the power to refuse to sell. He can control the price at which he himself sells, if he is willing when necessary to sacrifice volume for profit.

Now let's take a look at the buyer.

The purchasing agent has always been the red-headed stepchild of industry. In the beginning the boss did the buying in odd times. Then he detailed a young man to help him. As buying has grown in volume purchasing agents have become more important, until today in many progressive corporations the buying is done by a vice-president with an able staff, and he is a big man with a broad knowledge of markets and men. But in too many cases the purchasing agent still lacks the responsibility and authority he needs to make his job measure up to his titular function. Too often he is just expected to buy what he is told and his performance is measured by his ability to save money on price.

The Wrong Attitude

There are too many purchasing agents today working with a mental attitude that is protective, detective and combative. They are working with the defensive idea of getting what they must buy for the lowest price instead of the constructive, productive idea of developing the greatest possible value for the dollar spent. Financially it may be the same. But psychologically and economically it is very different. One is positive and the other is negative. One stimulates and the other depresses. One promotes co-operation and good service, and the other doesn't.

In the last few months I have discussed this business of buying with a good many men—purchasing agents and sales executives both. I have discovered one very interesting thing. Man after man has told me with pride and enthusiasm of the ideal relations which he has established with some buyer or some seller.

With this customer or this vendor he has understanding and reciprocity. They know each other. The seller appreciates just what this buyer needs in quality and in service. He knows the organization and how it works. He and the purchasing agent pull together like a team of good gray horses. They keep each other advised as to the trends of the market. When the factory is running slack they anticipate requirements a bit. They discuss costs and profits at times and protect each other. The buyer knows that in an emergency that seller's factory will turn itself inside out to take care of him.

There is no price cutting between this pair. They are dealing in values.

I know one purchasing agent who tries each year to call at least once upon the presidents of the principal companies from whom he buys. He wants to get acquainted, to see the factory and judge whether or not they are efficient, to size up the organization, the plant and the principles that stand behind the goods.

I know of one very large industrial buyer—one of the greatest in the country—who not so long ago sent a vice-president—no less—traveling the country calling on the presidents and sales managers of the manufacturing companies from whom he buys, just to inquire whether they were entirely satisfied with the treatment they were receiving from his people. I daresay he carried smelling salts to administer to those who were overcome by the shock. And when this vice-president returned home and had recovered from the entertainment he said that he believed this trip to have been one of the best investments his company had made, reckoned in terms of good will and insurance of material and service supply.

Some of the Costs

There are many enlightened buyers who are doing this kind of thing. They do it because it helps them in their business. It costs money in the long run to scatter business in small purchases, now from one and now from another. It costs money to haggle with salesmen. It costs money to bicker over bids. It costs money to break in new vendors, to establish specifications and assume quality.

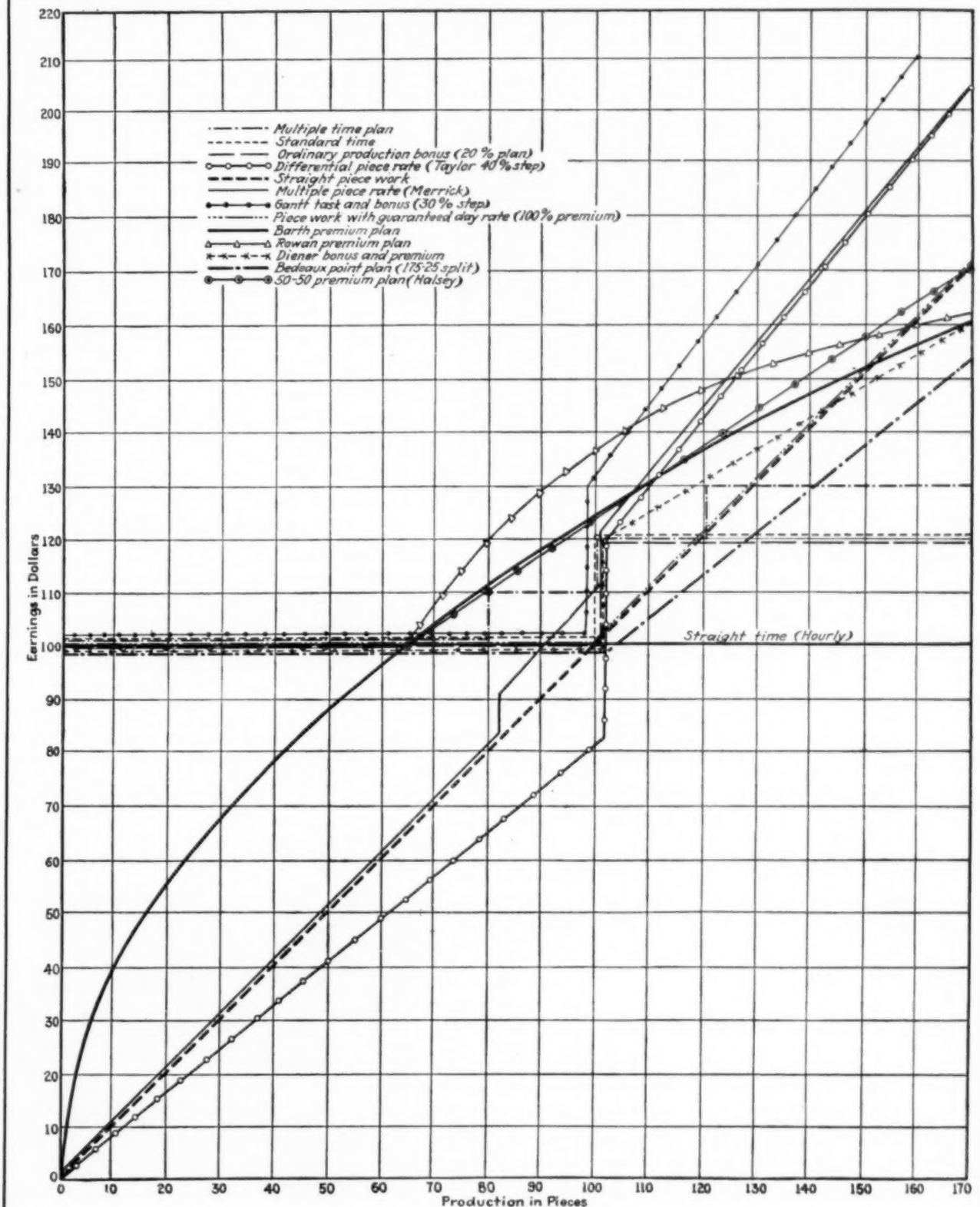
Therefore, if the purchasing agent is to contribute his share toward overcoming this practice of price cutting that industry is suffering from and stewing about right now, he must face these facts, and facing them he will bring new dignity to his profession and new opportunity to himself. He must recognize that nothing short of this ideal relationship between the seller and the buyer is really efficient and profitable. He must set his entire operation as nearly as possible on that plane and make value not price the chief objective. He must study the cost of buying as well as the cost of goods.

For who knows today which costs the most—to shop among fifty vendors or to establish a close co-operative relationship with twelve? How much more does it cost to interview fifty salesmen than to give the same time to representatives of six selected suppliers who qualify completely in all the other factors of value?

Oh, I know the arguments! There are good ones a-plenty on both sides. But the point I make is that we have too little accurate knowledge of what it costs to buy—too little recognition of the relative importance of value as compared with the mere price factor, too little measuring of price against the other factors. And in a word industry will have to learn more about the economics of buying and organize its purchasing on a more constructive basis for the production of better values in trade before we put an end to the ruthless waste of price cutting.

Price cutting is just an economic disease. It can be cured. It can be cured by public opinion within industry. And immediate relief can only be sought through the building of public opinion among buyers and sellers. But the only way there is to develop public opinion is by discussion that corrects loose thinking and makes clear the moral and economic principles which all men desire to follow once they are generally understood and have gained social standing.

Comparison of Wage Payment Systems


Multiple time plan
Standard time
Ordinary production bonus (20% plan)
Differential piece rate (Taylor 40% step)
Straight piece work
Multiple piece rate (Merrick)
Gantt task and bonus (30% step)
Piece work with guaranteed day rate (100% premium)
Barth premium plan
Rowan premium plan
Diener bonus and premium
Bedeaux point plan (175-25 split)
50-50 premium plan (Halsey)
Straight time (Hourly)
Earnings in Dollars
Production in Pieces
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220

Courtesy of the National Metal Trades Association

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· TECHNICAL · ABSTRACTS ·

Electrically Heated Melting Pots for Soft Metal

Electrically heated melting pots are used widely by industrial plants for melting soft metal such as tin, lead, solder and babbitt metal. The walls of such pots are well heat-insulated, and therefore, the external temperatures are low. Automatic-control maintains the metal always at the correct temperature. There are no fumes or gases thrown into the atmosphere to cause unhealthful working conditions. No attention is required from the workmen except to replenish the metal as it is used.

For general use, such as melting tin, lead, solder and babbit, modern pots are constructed with a cylindrical casing or jacket of steel plate and a crucible of cast iron. The space between the jacket and the crucible is packed with a high-grade heat-insulating material and the heating units are placed inside the crucible in direct contact with the metal to be melted.

The advantages of immersion units for heating metals up to 650 deg. F. are: Heat is generated within the metal itself, eliminating high external temperatures and the possibility of cracking the pot. Temperature control is better than with external firing due to the elimination of heat storage in the brick work. The overall dimensions are smaller. Any desired heat distribution can be obtained by moving the unit. Replacement of heating units can be made usually while the pot is in operation. More comfortable working conditions due to absence of excessive heat and products of combustion.

For temperatures above 950 deg. F. it is necessary to use external-heating units. For still higher temperatures, 1,500 deg. to 1,600 deg. F., pots of round or rectangular shape, having cast nickel-chromium crucibles are used. Electrically heated pots of this type are being used extensively by manufacturers of small tools. The advantages secured are a more uniform product, much longer life and lower maintenance cost, better working conditions, and in most cases an equal or lower heating cost than obtainable with fuel firing.—P. H. Clark and A. N. Otis, *Industrial Engineering*, April.

Common Errors in Machine Design

Usually the part that costs most in developing a special-purpose machine is making a model that will work. Machines costing thousands of dollars often prove incapable of performing the work for which they are intended, and large sums have been lost by investors in vain attempts to make such machines function satisfactorily.

Failure of a machine to operate satisfactorily, and the consequent detrimental effect upon the designer's reputation, often results from overlooking some seemingly unimportant factor. Some of the most common factors responsible for the failure of a machine to function properly are: centrifugal force; vibration; gravity; friction; distortion; variation in product; expansion and contraction and inaccessibility for repairs.

The necessity for balancing high-speed rotating parts is well known. The centrifugal force of an unbalanced part will shorten the life of a machine and cause inaccuracies in the work produced. Vibration may be caused by unbalanced members, or by the sudden putting in motion of heavy mechanisms by the action of a cam or similar movements. The Geneva motion, if required to move heavy loads, will cause vibration.

Gravity is often overestimated as a usable force, and ordinarily should be avoided as an unreliable means for operating a mechanism. The mere weight of a part is not always sufficient to carry it to the desired point, and often the direction taken by a falling member is entirely different from that counted on by the designer, owing to failure to consider the position of the center of gravity.

Every designer knows what friction is, and how to calculate the amount developed under given conditions, but its effect is overlooked in many cases and a much heavier load than was intended is placed upon some of the working parts.

Frequently machine parts, although properly designed to withstand the load intended, are subjected to much heavier stresses than were anticipated, and the distortion, however slight, may injure the machine or interfere with the operation of its mechanisms. In machines that are expected to operate under unusual temperature conditions the expansion or contraction of parts due to changes in temperature may be sufficient to prevent the functioning of the machine or some of its parts.

Variations in size and shape of materials to be passed through a production machine is probably one of the greatest causes of trouble in the operation of automatic assembling devices. When it is impossible to so design a mechanism that it will make allowances for variation in the stock it is to handle, it is necessary to provide eliminators or selectors that will prevent stock from entering the machine which does not come within the specified limits.

Many designers apparently consider the general appearance of the machine of greater importance than accessibility for repairs. Some machines are so designed that the part or material is fed through a hole at one end and is not seen again until it mysteriously appears, completely finished, at the other end of the machine. While appearance should be considered, especially in the case of machinery built for the open market, accessibility of its working parts is more to be desired. Neither accessibility nor appearance, however, should be allowed to influence the design to the detriment of production. — Herbert W. Cable, *Machinery*, May.

Life-Saving Light

Illumination cannot be called a guard nor a tool, and yet it partakes somewhat of the nature of both. We may have a turning lathe, cutting tool, micrometer, and material to work on, but not much progress can be made with them until illumination is provided. Good illumination is a powerful aid toward "good housekeeping." Untidiness and disorder are inert conditions and yet are active accident-causing agents. They become distressingly apparent under proper illumination, and someone is likely to observe them and let his appreciation of neatness dictate action.

The unshaded light—the local drop-cord lamp—is one of the principal offenders, and glaring lighting conditions set the stage for many accidents. A glaring light causes the iris to contract instantly, with the result that excess light is shut off; but when the glaring light is removed the expansion of the iris is slow compared with the contraction. To one who has been working under the glaring light conditions momentary blindness occurs as he turns away from the light. A man who is working at a lathe, therefore, with a drop-light a few inches above the level of the work and below the level of the eye, must be acutely conscious of the glaring light, and upon turning away is unable to distinguish the objects which are in the aisle. This man is thus likely to be injured by tripping over anything in the aisle.

Inadequate and spotty illumination must be charged with the responsibility for some accidents. There is many a shop in which spaces illuminated by a blaze of glaring light are bordered by zones of semi-darkness. These conditions are allowed to remain year after year notwithstanding the fact that proper illumination equipment is the least expensive and the most important safeguard that the average employer can provide for his workers. We do not know definitely how many of our industrial accidents are caused by poor lighting and defective vision, but various estimates indicate that from 10 to 20 per cent are due to these causes. The means and methods to prevent these unfortunate occurrences are known, are comparatively simple, and involve relatively small expense in any particular case.—R. E. Simpson, *The Travelers Standard*, May.

IDEAS · FROM · PRACTICAL · MEN

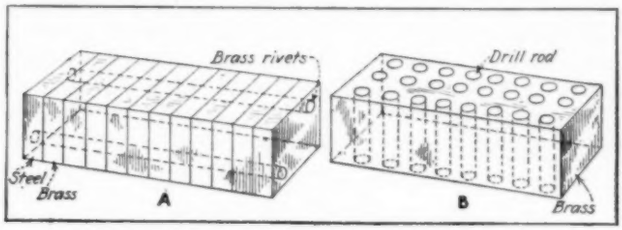
The department, "Ideas from Practical Men," is devoted to the exchange of information on methods useful to the machinery industries. Its scope includes all divisions of the metal-working industry, from drafting room to shipping platform. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for. The rates are from a minimum of five dollars upwards, depending upon their merit

Parallels for the Magnetic Chuck

By Edwin Last

Parallels for use on magnetic chucks are generally built up by placing together alternate blocks of steel and brass, or other non-magnetic metal, and holding them in place by long, through rivets, as shown at *A* in the illustration.

Another method of making such parallels, is to drill a series of holes in brass blocks and plug them with pieces



Two kinds of parallels for magnetic chucks

of drill rod driven in tightly, letting the ends come flush with the tops and bottoms of the blocks, as shown at *B*. Parallels of both these types have great holding power and work placed upon them can be ground without danger of its moving.

Modern Methods in a French Plant

By J. A. Lucas

In the manufacture of steering knuckles at the plant of Andre Citroen, Paris, up-to-date equipment is employed. After the knuckles have been turned and the flanges faced, they go to the eight-spindle drilling machine shown in Fig. 1, where the hole for the steering, or king, pin is drilled and reamed as it passes from the farther

Fig. 1—Drilling and reaming steering knuckles

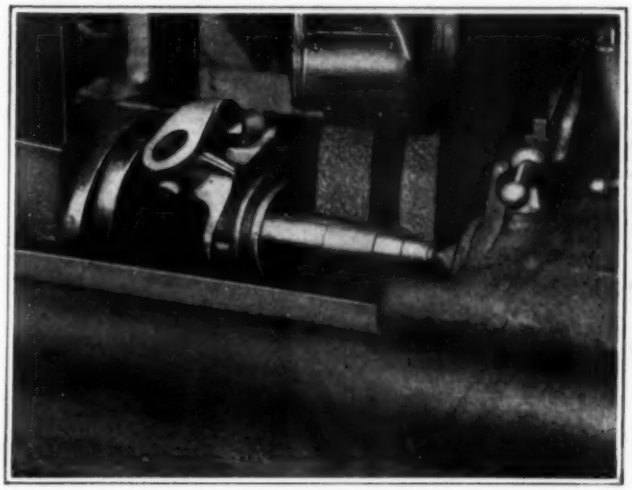


Fig. 2—Grinding two diameters at once

end to the front. Suitable fixtures are provided so as to locate the knuckles properly with relation to the face of the flange that carries the brake support for the front wheel. After the last machine reaming, the knuckles are run over the hand reamer shown held in one of the T-slots of the machine table.

Double wheel grinding is also used as shown in Fig. 2. By this method both ends of the wheel bearing are ground at once, each to its proper diameter, as in modern American automobile plants.

Railway Wrecking Crane Used to Install a Machine

By J. Madden

In my travels I came across the job illustrated, and I pass along the information concerning it on the chance that some of your readers can save money by making use of railroad wrecking equipment that would otherwise be idle. The railroads should be willing to co-operate because revenue so obtained is pure "velvet."

The special machine illustrated weighs 26 tons, and the base is 9x16 ft. It had to be placed on the second floor and taking it into the shop through the doors and raising it on the elevators would have meant disassembling. Four men would have been required for two weeks for reassembly. Since the moving parts of the machine are operated by hydraulic pressure of 1,000 lb. per sq. in., the taking apart of all piping would have been a serious proposition.

Charges by the railroad for the services of the 30-ton, 40-ft. boom crane and crew were $25; switching charges were $15, making a total of $40. The distance from the

Wrecking crane raising 26-ton machine from flat car to second floor

ground to the second floor is 16 ft. One hour elapsed from the time the hook was applied until the machine was on the second floor.

Two windows were removed from the side of the building and the pilaster between was taken out, as was the brick below the window sills to the level of the second floor. Work was started at 7 o'clock in the morning and at 8 o'clock two production machines were removed from their foundations opposite the hole in the wall to allow the special machine to pass. These machines were back in place and in production at 3 o'clock of the same day. By noon of the second day the special machine was set on its foundation.

The installation described was made in the plant of the Acheson Graphite Company, Niagara Falls, New York.

Section Liners

By Edgell R. Plaisted

Why are draftsmen so far behind the head of the procession as to be interested in section liners that require careful squinting to place them in proper position for drawing each and every line? Two such devices were shown, respectively, on pages 269 and 270, Vol. 68, of the *American Machinist*. If a fellow has an eye good enough for operating such devices, he should be able to soon train it to do correct "squint-placing" of his triangle without mechanical aids.

One of the first things I did when I was still a cub in the machine shop—and the only draftsman the firm then had—was to build a section liner that, when I pressed the button, "did the rest." No squinting was required.

But my reason for building this little device myself was not because such devices were not to be had in those days (even then they were catalogued), but I built it because I wanted the fun of making the thing, just as I wanted the fun of making the drawings, the patterns, and then finished up the castings for a split nut on the lead screw of the little old lathe that had been given the cub to run, probably because it was so nearly worn out he couldn't possibly do much more damage to it.

In our drafting room today we have one of these press-the-button section liners—not the one I made, but one made on a similar principle. I regret to say that the maker was not proud enough of it to put his name on it, so I can not tell you where duplicates can be bought. If the working speed of draftsmen is to keep up with that of the shophands, then they must be provided with up-to-date tools. The universal drafting machine is just as necessary in their work as is the multiple-spindle drilling or boring machine in the shop, and a "semi-automatic" section liner enables a man to hatch across a given space in a third of the time it takes to operate one of these hair-line squinting devices.

There is room for further improvement in section liners, however, and I've been hoping some smart Alec of the twentieth century would devise a section liner that would automatically space the lines for cylindrical shading for pieces of any diameter between $\frac{1}{4}$ in. and two inches. With a series of little celluloid templets to fit onto the machine, this is not impossible. Somebody ought to get busy and attend to it, for when draftsmen are continually making plans for machines to increase efficiency in other lines, they should in fairness to their own work concentrate occasionally on speedy devices for the drafting room.

Smoothing Patterns With a File
Discussion

By F. C. Edwards
Birmingham, England

The article by Donald A. Hampson, under the title given above, published on page 1025, Vol. 67, of the *American Machinist*, may easily lure the young patternmaker into time-wasting habits, besides giving him a false impression on an important point in casting production. Mr. Hampson would substitute the file for the sandpaper. The first objection to this lies in the fact that the file, calls for its own peculiar deftness of manipulation, which the young patternmaker does not ordinarily acquire.

Another objection to the file is that it soon becomes clogged with wood fiber. Admittedly, it may be cleaned, but this requires time and effort and more time may be spent in cleaning the file than in operating it. Sandpaper, in the same condition, is discarded. The cost of sandpaper, compared with workmen's time, is negligible. Frequent renewals of sandpaper may be regarded as a sure sign of efficiency in a patternmaker. Manifestly, he knows where true economy lies.

Even when in good condition and in capable hands, a file cannot compare in speed of action with a good sandpaper block and seldom has the same cutting area. The ordinary sanding block is, say, 3x4 in., and the whole of this surface is in effective operation. Few files have this area, and none are effective from tip to toe. There is, of course, a right, and a wrong way to use sandpaper. It should always be doubled on itself so that one sanded surface grips the block. It should be similarly folded when held in the hand without a block. Moreover, the block should be composed of cork or

similar material, and blocks of various shapes should be available.

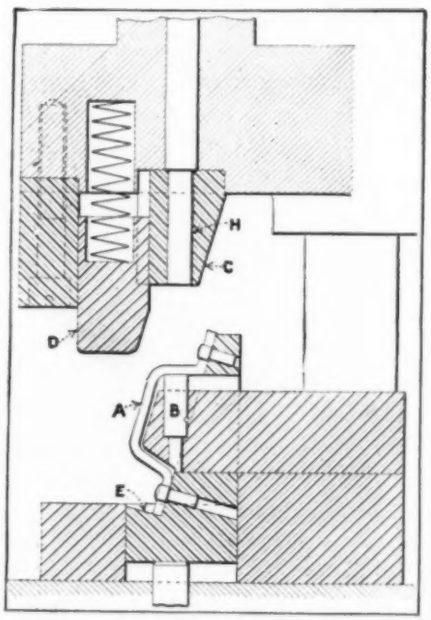
A file may be superior to sandpaper, as Mr. Hampson says, in finishing inner angles right out to a perfectly sharp corner. But, in so doing, it unquestionably produces an inferior pattern. It has been universally established that square, inner angles are objectionable features in any pattern. There are three principal reasons for this. First, the pattern with square corners cannot be withdrawn so cleanly from the mold as one that is nicely filleted. Second, the sharp inner angle produces a correspondingly sharp corner of sand in the mold. Now, unless the molder deliberately removes this corner (which, if he is wise, he will do, though the corner may require to be machined out square afterward), the metal inevitably washes away some of the sharp angle as it makes its way over the mold.

Comparatively large pieces of sand are sometimes dislodged in this way and wherever a portion of the mold is removed, the metal, of course, takes its place. This means that the corner of the casting is found to be more or less irregularly filled up. Furthermore, the displaced portions of sand being lighter than the metal, are carried along to the upper surfaces of the mold and thus form unsightly holes in the top of the casting. The third objection to the sharp inner angle is that it serves as a concentration point for shrinkage stress, and thus tends—especially in the case, say, of aluminum—to produce fracture. A small fillet, or radius, in the corner renders the moment of incipient fracture more indeterminate, and dissipates shrinkage stress.

Tools for Piercing Radial Holes

By H. B. Schell

In the design of press tools to pierce the radial hole in the piece shown at *A*, the disposition of the scrap piece punched out became the real problem. The solution is shown in the accompanying sketch, where the punch is shown at *B*, inside the work, and the die at *C*. While this arrangement is the reverse of usual piercing tools, it has the advantage of leaving the slug outside where it will cause no inconvenience. With the down stroke of the press, the spring pad *D* bears against the work, holding it on the locating pins. A slight further movement compresses the spring and the die contacts with the work. In piercing the work, block *E* is carried down, compressing spring under the bolster until the bottom of the stroke is reached. On the up stroke, springs under the bolster raise the block *E* and thus carry the work upward and clear of the punch, while at the top of the stroke the plunger *H* strikes the knockout rod, ejecting the slug from the die. It is then blown away by an air blast.

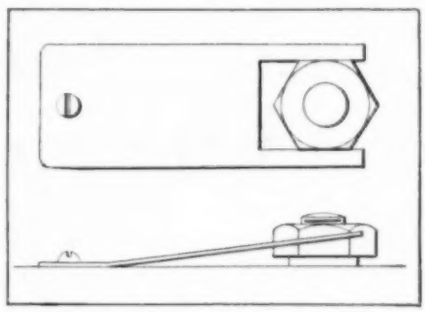


Press tools that solved a problem

A Spring Nut Lock

By R. H. Kasper

The sketch shows a spring nut lock that was used where the conventional type of lock washer could not be used, as the nut was used for adjusting an eyebolt and was never drawn up tightly. One end of a piece of flat spring steel is filed to fit the opposite flats of the nut, and is drilled on the opposite end for the fastening screw, as shown in the illustration. The lower face of the nut is turned back for a distance of about twice the thickness of the spring, so that the nut can be turned when the spring is held down. This lock is positive in operation and need not be removed when it is necessary to turn the nut, it being merely necessary to press it down below the flat sides of the nut by the wrench before turning the nut. If in adjusting the nut it is turned to a position in which the corners prevent the lock from engaging the flats, it cannot work off of the stud. If the nut turns, due to vibration, the lock will snap into place as soon as the flats come fair with those in the opening.



A simple nut lock

Dimensioning Drawings—*Discussion*

By John F. Hardecker

In Emile H. Dion's article under the title given above, on page 315, Vol. 68, of the *American Machinist*, he expresses himself as being in favor of Frank C. Hudson's original proposal to use high and low limits for dimensions, thus: $\frac{2.751}{2.750}$ instead of the unilateral system, as $2.750\ ^{+0.001}_{-0.000}$ which I favored.

One thing that I think Mr. Dion overlooked, however, is that dimensions so expressed must be repeated in many parts of a drawing, while with the unilateral system they can be covered by a note over the title block, thus: "Limits 0.0005 in. except as noted." This is obviously the easiest way to take care of the preponderant number of dimensions on a drawing, and is perfectly consistent when the unilateral system is used. If it is used in conjunction with Mr. Hudson's system, it is liable to create confusion in the mechanic's mind, due to the use of two different systems on the same drawing. If both dimensions are given, both upper and lower limits, in every case, it entails additional work on the draftsman and tends to clutter up the drawing.

American Machinist

Editors: KENNETH H. CONDIT AND FRED H. COLVIN

Established 1877

Where the Shoe Pinches

ALL of the elaborate trade barriers set up by the various Continental European countries in the endeavor to protect this industry or favor that friendly country result in just one thing, the hardship of their own consumers. There are other interests than those of the consumer to be considered, it is true, but the politician cannot afford to lose sight of the fact that the consumers represent the voting majority and can make things exceedingly unpleasant if pushed too far.

Much criticism of the customs barriers set up by the United States has been freely expressed, yet the American customs classification lists but some 705 items while that of one European country carries ten times that number. The hardship on the exporter who must fit his product into the proper classification pigeon hole is obvious. What is not so obvious, but distinctly more detrimental, is that the consumer must pay the high price of a special item instead of the much lower one of a standardized commodity for which there is world-wide distribution.

For this reason, if for no other, the movement started at the International Economic Conference in Geneva, a year ago, and the subsequent steps taken to put its recommendations into effect, have been of large importance to international trade. Not so much progress has been made as we might like to see, yet there has been real progress, and the results are far more tangible than many disillusionized observers believed they would be. The European consumer has had some relief from burdens that were oppressive.

A Boon to Foreign Business

IF THE Congress just ending had nothing else to its credit the passage of the Jones-White bill over determined, if ill-advised, opposition would be sufficient justification for its convening. Through the terms of this bill the American merchant marine, which was rapidly approaching extinction by the competition of other fleets, gets a new lease on life. More liberal insurance provisions, better rates for ocean mails, particularly when carried on fast ships, and construction loans at low rates should make it possible for American shipping interests to make a start toward regaining the position they once held. With private operation profitable there will be no further need for the Government to remain in the shipping business.

Opinion of shipping men and others well-informed on the technicalities of the situation is highly favorable. We may expect, therefore, a renewal of activity in American shipyards as orders for faster ships are placed. It has become painfully evident that 11-knot ships cannot compete with 14-knot ships, as should have been obvious to any sensible individual. Faster ships can now be laid down and the activity of the yards will be reflected in many other branches that supply them.

But by far the most important result of the Jones-White bill will be the stimulus to foreign trade that must follow. American manufacturers and merchants can look forward to much better facilities of every sort and should be prepared to make the most of them.

Vacations—Scattered or Concentrated

VACATION periods are full of problems for the executive, whether he be the foreman or the general manager. From June to October one or more men or women are likely to be absent from any department. It is necessary to plan these vacations so as not to upset the working capacity more than necessary, but, at best, scheduled production is difficult to maintain.

An alternative is to have a vacation period for the whole plant—to shut up shop for one or two weeks and have all take their vacations at that time. During this period it is customary for the maintenance men to make repairs, to shift machines and make other changes. These men are of course given a vacation period at another time. It is also found advisable to have some one in the office to answer urgent inquiries or to meet visitors who do not know of the shutting down custom. Such vacation periods should be announced to customers.

This plan is not new. It has been used for many years by well known concerns and seems to be growing in favor. Shop executives like it because it does not cripple their working force over an extended period. The plan is worthy of careful consideration by plant managers.

It is not to be expected that such a plan will please everyone, especially at the beginning. But those who use it seem to like it.

· SHOP · EQUIPMENT · NEWS ·

Mikron No. 102 Automatic Universal Gear Hobber

PRECISION hobbing of small spur gears may be performed on the Mikron No. 102 universal gear hobbing machine which has been introduced into this country by the Triplex Machine Tool Company, 50 Church Street, New York, N. Y. The machine, which is illustrated in Fig. 1, has a capacity for hobbing spur and helical gears and pinions up to 5¼ in. in diam. and 5½ in. in length. It is regularly furnished with countershaft, pump, oil reservoir, cabinet base for holding tools and with complete tools.

Gears may be hobbed with a number of teeth ranging from 6 to 325 and having either right- or left-hand spiral angles up to 70 deg. The maximum pitch that can be hobbed is 12 D.P. Change gears are used on the machine for obtaining various divisions and all gears are completely inclosed in the machine. Change gears are easily accessible.

The blanks to be cut are held firmly on the arbor during the hobbing operation and slip is prevented. In practice a spare arbor mandrel is utilized so that it can be loaded while the other is in the machine. The feed of the hob can be varied to suit the material being cut as the change gears permit variation of the feed from 0.004 to 0.030 in. per revolution of the work.

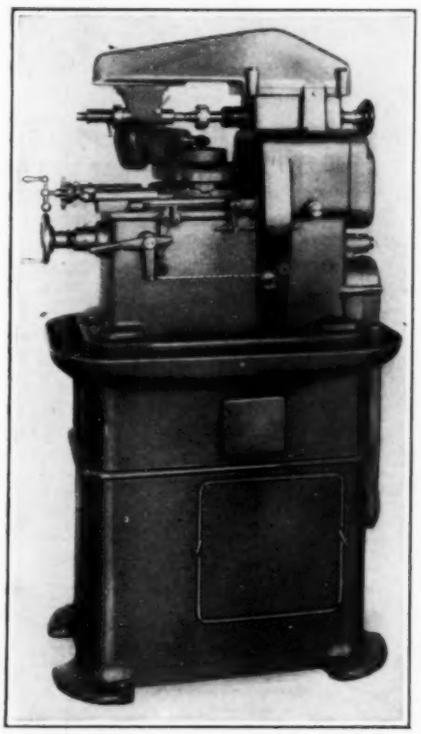


Fig. 1—Mikron No. 102 Automatic Universal Gear Hobbing Machine

The differential gearing is simple and is composed of only spur gears on parallel spindles mounted in a cylinder which can be removed from the machine in a few moments. The worm spindle is mounted eccentrically in the cylinder so that all play between the division wheel and the worm can be eliminated by a slight rotation of the cylinder. A strong overarm support with an adjustable tail center rigidly holds the work in place. The swivel cutter head can be rotated through an arc of 180 deg. The machine is regularly furnished with micrometer dials having large graduations and all working parts are hardened and ground. A draw-in spindle for holding work in spring collets is regularly furnished.

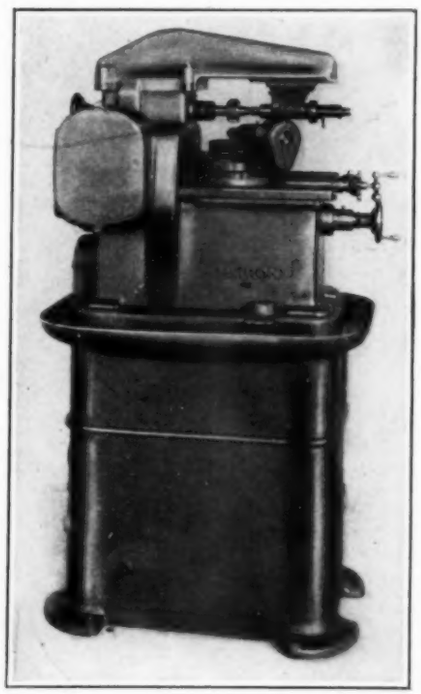


Fig. 2—Rear view of the machine

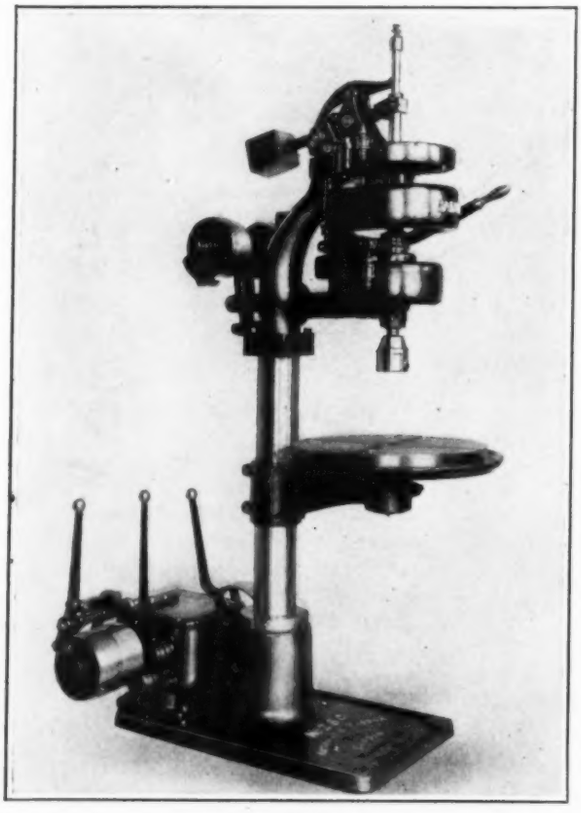
By means of a special attachment the machine can be used for hobbing small bevel gears with accurate tooth form. The machine has a capacity to cut bevel gears up to 3 in. in diameter with a bevel angle between 0 and 180 deg. and as coarse as 20 diametral pitch. This bevel gear attachment is not illustrated but is attached to the machine by removing the overarm support.

An aluminum oil reservoir for receiving the cutter lubricant is contained in the base of the machine and has a filtering compartment. Easy access to the reservoir is provided by means of a removable door as shown in Fig. 2. The approximate weight of the machine with countershaft is about 600 lb. and the floor space occupied is 2 x 3 feet.

Speed Box for Garvin Nos. 2-X and 2-BG Tapping Machines

Direct shifting from one to another of four speeds is the principal feature of the speed box which has been developed by the Western Machine Tool Works, Holland, Mich., for use with the Garvin No. 2-X and 2-BG automatic tapping machines, manufactured by this company, of either the belt-driven or the motor-driven type. The No. 2-X belt-driven machine shown in the illustration has the unit bolted directly to the base, whereas for the motor-driven machine it is placed upon a separate base with the motor attached. Timken tapered roller bearings are used on all shafts.

The gears may be shifted from one speed to another by means of levers which are within easy reach of the operator. The gears are made of chrome-nickel alloy steel, heat-treated and hardened. The two sliding-cone gears have long bearings thus preventing chattering, and making possible easy shifting. They are of coarse pitch, and the ends of the teeth are rounded for easy engagement. The gears, Timken bearings, shafts, shifter forks and lever fulcrums are lubricated by the bath of oil in the box. All shafts are ground and are provided with fine-threaded nuts for



Speed Box arranged for direct-connected motor drive to a Garvin No. 2-X automatic tapping machine

close adjustment of the bearings. This adjustment may be made from the outside of the box.

The units are ordinarily furnished with 1,200-r.p.m. motors. When such a motor is used, the 2-X automatic tapping machine has spindle speeds of 223, 300, 432 and 582 r.p.m., while the No. 2-BG machine has spindle speeds of 56, 76, 109 and 149 r.p.m. Should the No. 2-BG tapper be equipped with an 1,800-r.p.m. motor, the resultting spindle speeds would be 84, 114, 153 and 224 r.p.m. In any case, a constant-power input is made possible by the use of these speedbox units.

Cutler-Hammer Shipper-Rod-Operated Master Switch

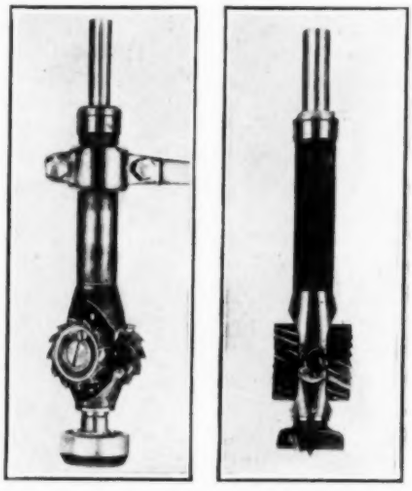
This switch, made by the Cutler-Hammer Manufacturing Company, Milwaukee, Wis., is for use as a pilot circuit control device on lathes and other equipment where starting and stopping of the machine is to be governed by a splined shaft or shipper rod. The switch is designed especially for three-wire control, but can also be used for two-wire control on pilot circuits up to 550 volts. This switch may be mounted at the end of the machine, the splined shaft or shipper rod running the full length of the machine.

In operation, moving the switch to the "on" position starts the motor. Throwing the switch in the opposite direction stops the motor. It is of simple construction with few parts to break or get out of adjustment. The main bearing consists of a steel shaft running in a long brass bushing to reduce wear. The operating lever is clamped to a square steel shaft so that it can be shifted to any one of four positions, 90 deg. apart, to suit mounting conditions as will be noted in the cut.

The mechanism is protected against damage by a shear pin. This shear pin fastens the operating mechanism to the main shaft. Any undue strain on the mechanism will cause the pin to shear, thus making the switch inoperative. A heavy pressed-steel, dust-proof inclosing case, arranged for conduit wiring, protects the switch. The cover can be removed by loosening two screws that can be seen in the illustration.

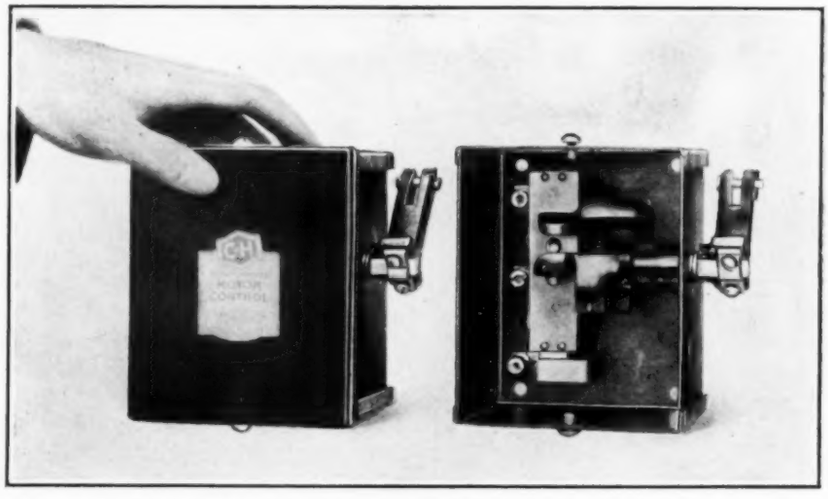
Schmidgall Boring and Milling Tool

Milling, shaping, key cutting, grooving and dove-tailing are operations which may be performed with this tool invented by Carl Schmidgall, of Peoria, Ill. The device has been used in boring stone, wood, glass, iron, steel and copper.



Schmidgall Boring and Milling Tool

The cutting is done by two large milling cutters and two small milling cutters which intermesh with the larger cutters. All four cutters are mounted upon bevel gears which are driven by gears on the internal shaft.



Cutler-Hammer Shipper-Rod-Operated Master Switch

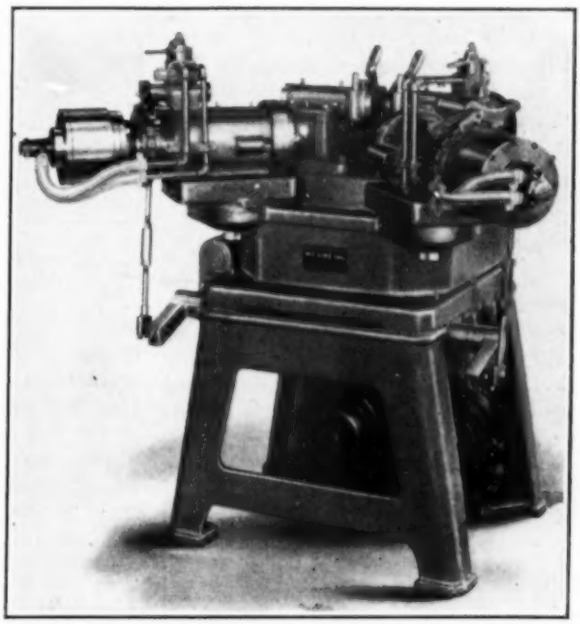
The gears are not exposed to dirt and are protected by an annular flange. Each cutter has an annular groove in one of its faces coinciding with the flange. The bottom cutter bores a round hole and the side cutters follow through and cut the shape of hole desired. In steel or stone a round hole is bored first and the tool shown at the left of the figure is used as a milling machine to shape the hole according to the design. For material such as glass, grind stones, and other hard materials, black diamonds are mounted on the cutters. In actual test a hole was cut through a grind stone 2 in. thick in 2 min. with this tool, and no tool sharpening was required.

Littell Reels for Feeding Punch Presses

Four reels for feeding coil stock to punch presses have been placed on the market by the F. J. Littell Machine Company, Chicago, Ill. The No. 1 reel, shown in Fig. 1, has an automatic brake which is intended to prevent overruns. The roller rides lightly on the stock while it is feeding, but as soon as the feed stops pulling, the brake pushes the roller down hard on the stock automatically. The No. 2 reel shown in Fig. 2 is designed to carry heavy coils, and will take stock up to 8 in. in width, although it can be furnished to take stock 12-in. wide. Note that the base is designed in such a way that tipping is prevented. The No. 1 cage-type reel is designed to handle spring steel, phosphor bronze, and other spring metals. The reel itself does not revolve, but the coil revolves within the reel and the stock passes out over the arms of the device. The No. 1½ ball bearing reel with plates, shown in Fig. 4, is intended for very wide stock up to 16½ in. in width. It is suitable for coils with small holes. The thick body prevents creases.

Lipe Improved Spiral Bevel Gear and Pinion Chamfering Machine

CHAMFERING of spiral bevel gears and spiral bevel pinions may be accomplished on this machine which has been announced by W. C. Lipe, Inc., 208 South Geddes Street, Syracuse, N. Y. It is manufactured in both single-spindle and double-spindle types. In the accompanying illustration, a double-spindle machine is shown. A production of 120 pinions or 80 gears per hour per spindle is guaranteed. As designed, the machine removes the burr and chamfers the acute angle at the ends of the teeth on both the inside and outside diameters of spiral bevel gears and on both ends of the teeth of spiral bevel pinions. A gear is shown clamped in position in the left-hand spindle of the machine illustrated. By means of an internally-formed hollow mill the chamfer is made to conform to the shape of the tooth. The gears or pinions are clamped to the workhead by means of an air-actuated chuck. The indexing mechanism is made positive in action by means of an interlocking device. Both the index and feed mechanisms are cam actuated. It is claimed that the machine is quiet in operation. Each spindle is driven by an electric motor built into the base, which is of massive construction.



Lipe Improved Spiral Bevel Gear and Pinion Chamfering Machine

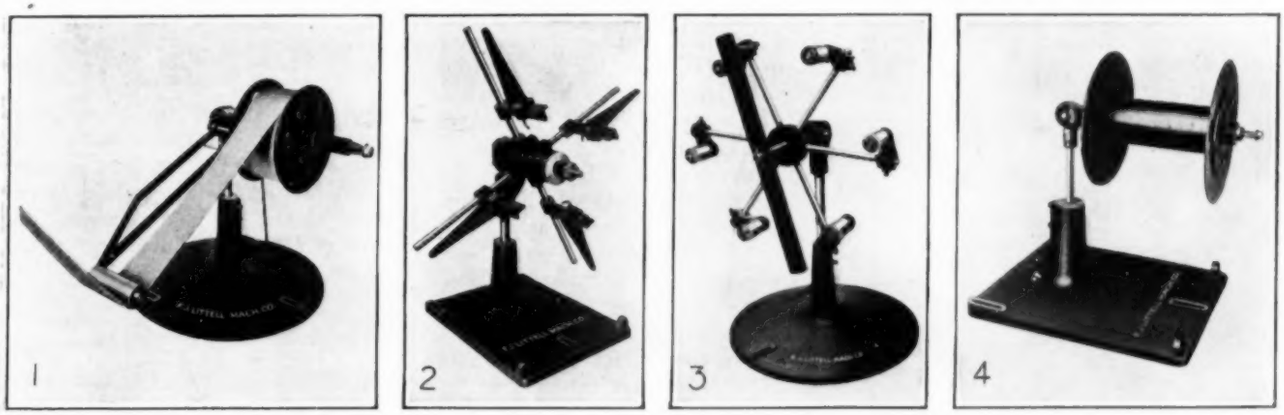


Fig. 1—Littell No. 1 Reel with automatic brake. Fig. 2—Littell No. 2 Reel designed for heavy coils up to 8 in. in width. Fig. 3—No. 1 Cage Type Reel designed for spring metals. Fig. 4—No. 1½ Ball Bearing Reel with plates intended for stock up to 16½ in. in width. All these reels have heavy bases which cannot be tipped easily

Gleason Improved Generator Tool Grinder

AN IMPROVED generator tool grinder, shown in Fig. 1, is being placed on the market by the Gleason Works, Rochester, N. Y., and is designed to sharpen the tools used on any of the Gleason straight bevel gear generators and the 60-in. spiral bevel gear planing generator.

The machine is equipped with two grinding wheels, the upper tools being sharpened on one wheel and the lower ones on the other. The grinding is against the cutting edge of the tools to prevent burning of the edges. Tools can be ground to any side rake angle by loosening the clamp on the top of the tool holder, shown in Fig. 2, and turning the tool to the desired angle. The desired front rake angle can be obtained by a similar setting at the point where the holder is attached.

The work is pushed across the wheel by hand, and is fed in by a hand nut on the end of the shaft on which the holders and work are mounted. Three different pairs of tool holders can be used, but only one pair is furnished as standard equipment with the machine. Standard machines are belt driven, but if desired they can be arranged for motor drive as shown in Fig. 1. A ¾-hp., constant-speed motor running at 1,800 r.p.m. is required.

The machine is simple in design but is sturdily built. The grinding wheels are mounted on a spindle which runs on precision ball bearings. One main oil cup supplies oil to the spindle and bearings, and can be checked through an oil sight-feed. On the motor-driven machine the power is transferred from the motor to the spindle by a belt which runs in the standard. The required floor space is 18x21 in., and the weight of machine is 375 pounds.

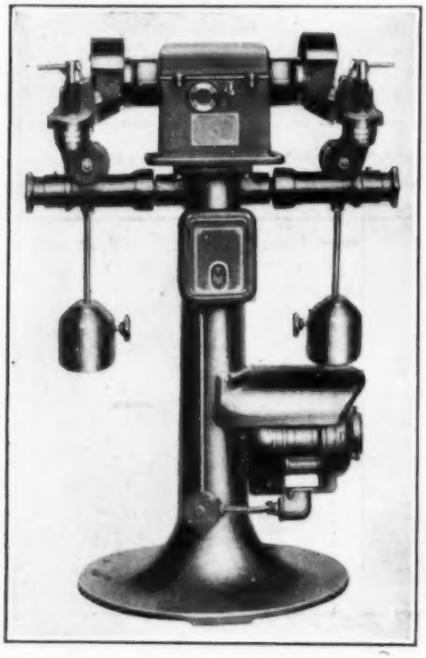


Fig. 1—Gleason Generator Tool Grinder with motor drive

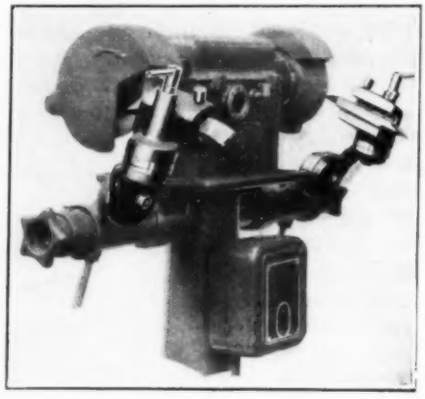
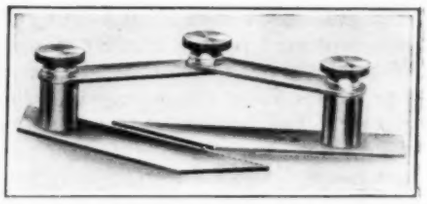


Fig. 2—View of the tool holders having fine adjustments

Brown & Sharpe No. 502 Improved Combination Bevel

This No. 502 improved combination bevel is suitable for use by tool makers, patternmakers, and draftsmen. It is made by the Brown & Sharpe Manufacturing Company, Providence, R. I. A feature of the design is the two posts which permit an unobstructed view of any angle at which the blades may be set. These posts also give clearance for scribing or drawing lines the full length of the blades. They also make possible the use of the blades on alternate sides of a projection up to ⅞ in. in height.

The back of the tool is flat and can be laid directly on the work. The clamp nuts are designed so that the blades can be moved freely without looseness or locked securely by tightening the clamp nuts. The blades, which are ground on all sides, are of steel and their ends are ground accurately to angles of 30, 45, 60 and 90 deg. The posts are made of a light metal to decrease the weight.



Brown & Sharpe No. 502 Improved Combination Bevel

Snellex Anti-Friction Centers

Anti-friction centers have been added to the line made by the Snellex Manufacturing Company, Rochester, N. Y. The device is shown in Fig. 1. This center is made for production work and automatically takes up the expansion of the work by a hardened steel cushion, shown in the cross-sectional view Fig. 2. It does not need lubrication on the center point because the roller bearings eliminate the wear between the point and the work. The wear of the bearings is automatically taken up since both tapered roller bearings have the thrust in the same direction, as may be seen in Fig. 2. A strainer at the bottom of the oil hole removes any dirt or grit from the lubricant. This

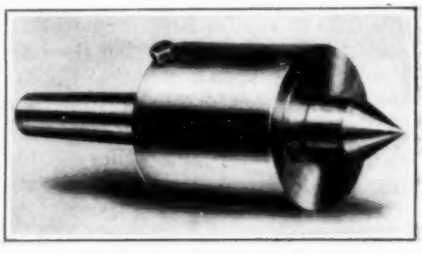


Fig. 1—Snellex Anti-Friction Center

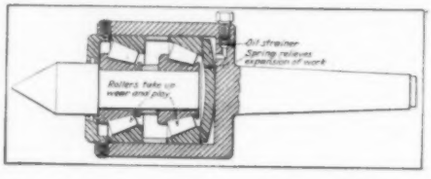
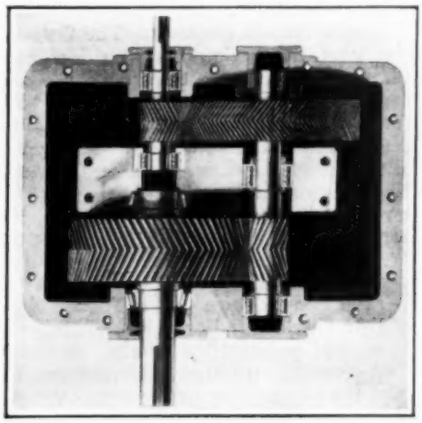


Fig. 2—Cross-section of the Snellex Anti-Friction Center

center can be furnished in sizes up to 3 tons load capacity and can be made with any kind of tapered shank and any kind of center point to turn car axles, crank shafts, gears and other work.

James Continuous-Tooth Herringbone Speed Reducers

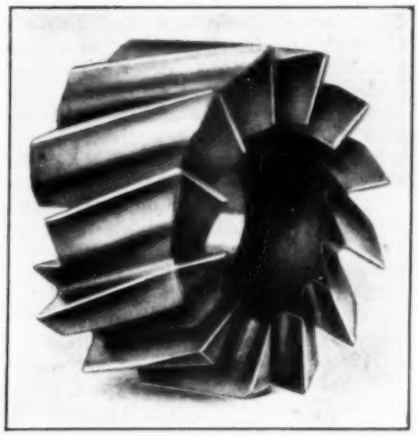
Continuous-tooth speed reducers having generated teeth have been brought out by the D. O. James Manufacturing Company, Chicago, Ill. These reducers are built in both single and double types. The single-type reducer is equipped with Timken tapered rolled bearings on both high- and low-speed shafts. The illustration shows a double-type reducer equipped with Hyatt roller bearings on high, intermediate and low-speed pinion shaft, and with Timken tapered roller bearings on the slow-speed gear shaft. Ample space is provided within the housings of both types for lubricant.



James Double-Type Continuous-Tooth Herringbone Speed Reducers

Brown & Sharpe Spiral Shell End Mills

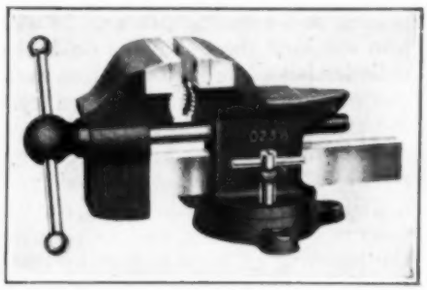
Both right-hand and left-hand spirals of these end mills which have been introduced by the Brown & Sharpe Manufacturing Company, Providence, R. I., are available. They are made in fourteen sizes, with diameters from 1¼ to 6 in. and will take cuts from 1 to 2¼ in. Arbors can be furnished to accommodate these cutters for use on Brown & Sharpe milling machines having threaded or taper-nose spindles, and on all milling machines having the standardized spindle end.



Brown & Sharpe Spiral Shell End Mill

Athol No. 023½ Universal Vise

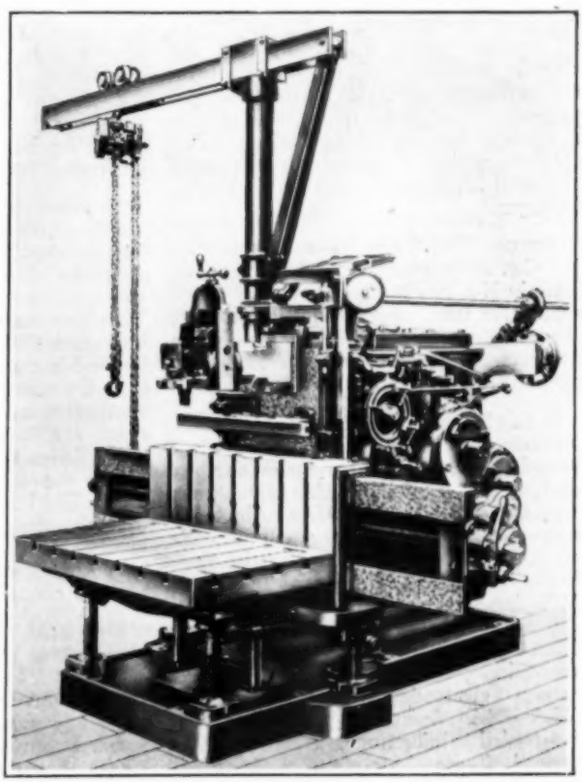
A small bench vise with 3½-in. jaws, primarily intended for service in garages, but adaptable to any kind of work within its range, has been brought out by the Athol Machine & Foundry Company, Athol, Mass. The principal castings are of semi-steel, and the inserted jaw-faces are of hardened tool steel. The beam is also made of tool steel. The tool steel screw is provided with a buttress thread. The swivel base permits the vise to be locked firmly in any one of several positions by means of a tapered dowel. Pipe grips are secured by blind screws to the main casting and movable jaw. They are so designed that they do not interfere with work held in the main jaws in the usual manner, but may easily be removed if desired. The pipe grips and the checked jaw-faces are made to standard gages, so that new ones can be furnished promptly for replacement purposes. The anvil adds to the usefulness of the vise as it extends its scope of service materially.



Athol No. 023½ Universal Vise

Morton High-Duty Draw-Cut Planer

This draw-cut planer was designed for railroad work, but it is suitable for shops where there is a great deal of short stroke shaping and planing to be done. The machine has been developed by the Morton Manufacturing Company, Muskegon Heights, Mich. The particular work for which the machine is intended is the machining of the guide yokes, tie



Morton High-Duty Draw-Cut Planer

braces, and cross-tie braces. It will also machine the guide fits on back-cylinder head blocks, locomotive deck castings, casting units between cylinders, and other work.

This machine has a 38-in. cutting stroke, a 60-in. horizontal feed, and a 21-in. vertical feed. It is of the 4-screw type which makes possible the handling of large and bulky castings. Rapid power-traverse both horizontally and vertically are part of this machine. All feeds are automatic and can be changed while the machine is in operation. It is equipped with a rotating arbor for slotting and finishing driving boxes, and will accommodate all special Morton attachments for railroad work.

Trade Catalogs

BALL BEARINGS. The New Departure Mfg. Co., Bristol, Conn., has published catalog No. 800 giving the dimensions and load ratings for double-row, single-row, Radax, magneto, oil-shield and front-wheel bearings. The catalog contains 40 7x4-in. pages.

FLEXIBLE SHAFT EQUIPMENT. The N. A. Strand & Co., Chicago, Ill., has published catalog No. 24 illustrating and describing the various types of flexible shafts and equipment for various machines of its manufacture. Of particular interest is the pictorial presentation of the various uses of this equipment for several operations. The catalog, which is pleasingly arranged and well illustrated, contains 47 11x8½-in pages.

FUSES. The Trico Fuse Manufacturing Co., Milwaukee, Wis., has published bulletin No. 206-B, concerning the Trico renewable fuse. An overload test chart is given showing the time-lag in minutes for each of the various overloads for different sizes.

G.E. PUBLICATIONS. The General Electric Co., Schenectady, N. Y., has issued a series of publications on various equipment. Bulletin GEA-19D shows type Cr 7006-D4 and D5, a.c. inclosed magnetic switches for small motors which are thrown directly on the line. Bulletin GEA-468A shows Type CR 3105 drum-type controllers for use with d.c. adjustable-speed motors. Catalog GEA-569A shows constant-potential arc-welding sets for both metallic and carbon electrode welding. Bulletin GEA-724A describes totally-inclosed, fan-cooled induction motors, "900 series" frames, for two- and three-phase applications from 1 to 15 hp. Bulletin GEA-743A describes type Cr 3202 drum controllers for two- or three-phase, slip-ring induction motors. Catalog GEA-823A describes atomic hydrogen arc-welding equipment. Catalog GEA-865 shows multi-speed induction motors of either squirrel-cage or wound-motor types. Bulletin GEA-874 shows the Type WD-200A arc welder of 200-amp. rating. Bulletin GEA-881 shows the WD-200A arc welder driven by a gas engine. Catalog GEA-588A shows geared, centrifugal air-compressors units. Catalog GEA-949 shows type CR 2904 temperature-overload relay panels for use with CR 1034—J2, —H2 and —H3 hand compensators. Bulletin GEA-980 shows Type CR 1203 inclosed speed-regulating rheostats for starting and field control of d.c. motors.

HAND CRANES. The Whiting Corporation, Harvey, Ill., has published bulletin No. 185 describing the hand power cranes of its manufacture. These cranes are manufactured for low head-room requirements. A table of specifications showing the capacity in tons of each size and the principal dimensions for the power bridges and the power trolleys are given. This material is supplemented with the dimension sheets. The bulletin contains four 11x8-in. pages.

LATHES. The Greaves-Klusman Tool Co., Cincinnati, Ohio, has published a catalog showing lathes to swing work 14, 16, 18, 20 and 24 in. in length, in medium sizes, and 24 to 30 in., in heavy sizes. Types available are 4-step single back-gear, 3-step friction double back-gear, and geared head giving 10 speeds. Constructional features of these lathes are shown by photographs. Several pages are devoted to attachments for the foregoing lathes. The catalog is well illustrated throughout.

MOTORS. The American Electric Motor Co., Cedarburg, Wis., has published bulletin No. 102 giving a general description of the various types and advantages of the motors manufactured. The two- and three-phase induction motors are built in capacities from ½ to 200 hp. and in the following types: open, inclosed, non-ventilated inclosed, pipe-ventilated, and inclosed self-ventilated. Some are ball-bearing equipped, others have sleeve bearings. Vertical motors can be supplied for either belt or direct drive. The back-geared motors are built in both open and pipe-ventilated types in sizes up to 30 hp. Each type is illustrated by means of photographs. The bulletin contains 19 11x8½-in. pages.

MOTORS. The Louis Allis Co., Milwaukee, Wis., has published several catalogs: No. 502A covers inverted rotary converters; No. 504 describes slip-ring motors; No. 505 describes squirrel-cage motors and No. 506 shows single-phase squirrel-cage condenser motors. Each type is illustrated by means of photographs. In Bulletin 505, many special squirrel-cage motors for machine tool use are shown. Bulletin 506 shows the recently developed single-phase squirrel-cage condenser motor which has unusual characteristics. These catalogs show the motors applied to many different types of equipment.

TAPS AND DIES. The Winter Bros. Co., Wrentham, Mass., has published Catalog No. 16, showing special taps, machine-screw taps, nut taps, pipe taps, pipe reamers, die heads, tap wrenches and die stocks. In addition, over 60 pages are devoted to tables on the various commercial tolerances and sizes of taps, cutting speeds and wire gages. This catalog is handsomely printed and contains 144 7x5-in. pages.

TOOL STEEL HANDBOOK. The Columbia Tool Steel Co., Chicago Heights, Ill., has published the third edition of its complete treatise on the use of tool steels. A large part of the handbook is given over to the applications and types of tool steels, and is supplemented with 18 pages of tables. In addition to the index, a list of trade customs, etc., is appended. The catalog contains 64 7x5-in. pages.

TUBE COUPLINGS. The Parker Appliance Co., 10320 Berea Rd., Cleveland, Ohio, has published a catalog showing tube couplings made in various forms to take the place of ordinary pipe fittings. These couplings are intended for use on tubes Nos. 2 to 16, inclusive, which have outside diameters from ⅛ to 1 in. Tables are included of the safe working pressures for copper tubing.

USED MACHINERY. The Bertolette Machine Tool Co., Jersey City, N. J., has published a catalog showing a partial list of new and used machine tools available at its warehouse. Many representative tools are shown by photographs. The catalog contains 36 9x6-in. pages.

Pamphlets Received

GERMAN METAL WORKING INDUSTRY. The United States Department of Commerce, Bureau of Foreign and Domestic Commerce, has issued Trade Information Bulletin No. 540, known as "German Metal-Working Machinery Industry and Trade," by Theodore Pilger, American commissioner at Berlin. The bulletin compares the German imports of machinery for various years and indicates the rapidly expanding market for American machine tools. The German industry and trade are reviewed, while the enormous progress made toward adjustment of manufacturing and sales methods to latest practices is discussed. Copies may be obtained from the U. S. Government Printing Office for 10 cents.

NEWS OF THE WEEK

Austrian Metal-Working Industry Shows Slight Improvement

ACCORDING to a report issued by U. S. Consul John F. Nurley, at Vienna, conditions are in general more favorable in the Austrian machinery industry than in recent years and a further increase in activities is anticipated because of the increasing demand of local industries.

Notwithstanding an increasing domestic demand, however, the industry is largely dependent on exports. In the neighboring countries, however, sales are limited by high import tariffs, and in other territories it is difficult to meet the competition of the well-established German, English and Belgian manufacturers, as well as of those of other nationalities. Keen competition, chiefly German and Czechoslovak, must be met also on the domestic market.

The German machinery industry, on account of its large domestic market, is in a position to compete successfully with the Austrian industry through mass-production methods. The Austrian industry cannot follow these methods on account of the small domestic market and therefore labors under a higher production cost.

Steam engine factories are well occupied chiefly in manufacturing certain types of stationary steam engines new to this market. A slight increase in demand is also reported with regard to smelting plant and rolling mill machinery, a trend which may be explained by increased activity of the iron and steel industry during the last twelve months. The demand for mining machinery continues to be weak,

As a result of gradually increasing efforts of the Federal government and the governments of the various states and communes to improve Austrian roads, sales of road making machinery and quarrying machinery, including compressor units and apparatus driven by compressed air have increased considerably during recent months. However, competition on the domestic market is very keen, since the total capacity of the local industry far exceeds the demand.

Sales of elevators and allied machinery have increased about 25 per cent as compared with the preceding year while the total number of workers employed increased only 10 per cent. Notwithstanding this improvement most factories are working at only 50 per cent of their total capacity.

The production of the metal working machine tools industry continues on a very low level, because of slack sales, particularly in the domestic market. The distinct improvement in local business which occurred during the third quarter of 1927 was only temporary.

Machinery is a comparatively important export of Austria, contributing more than five million dollars towards the reduction of the country's large trade deficit. Total Austrian machinery exports for the first nine months of 1927 amounted to $12,196,714 as compared with $17,914,300 for the whole of 1926. Assuming that exports during the fourth quarter of last year were on the same level as during the first three quarters, total exports for 1927 decreased almost ten per cent. This is indicative for the unfavorable conditions prevailing in general in the Austrian machinery industry, since many other industries were able to increase exports during 1927. The most important markets for Austrian machinery are the States of Succession of the former Monarchy. Machinery exports to the United States for 1927 totaled only $115,316.

Large quantities of machinery are imported, chiefly from Germany. Total imports for the first nine months of 1927, the latest available statistics, amounted to $9,566,000 as compared with $12,781,851 for the whole of 1926.

The year 1927 showed no material change in the position of the United States on the Austrian machinery market. Imports from the United States during the period in question totaled $202,300 or 2.1 per cent of the total imports, as compared with $279,571 for the whole of 1926, or 2.2 per cent of total imports. American machinery enjoys a good reputation on this market, but due to additional freight charges only special machinery. can find a market.

Prizes for Essays on Reduction of Distribution Costs

Through the courtesy of Alvan T. Simonds, president, Simonds Saw & Steel Co., the American Management Association announces $1,500 in prizes for the best essays on the subject: Reducing the Costs of Distribution. The purposes of the awards are to arouse a more general interest in the subject of economics as related to the individual and general welfare and to increase the general understanding of the application of economics to business. The first prize of $1,000 for the best essay is open to business executives, while a $500 prize is offered for the best essay from students and instructors in college. The contest closes Dec. 31, 1928. Papers should be sent to the director of the Association, 20 Vesey St., New York City.

Billings & Spencer Planning Financial Reorganization

Directors of the Billings & Spencer Co. announce a revaluation of assets showing a shrinkage of $1,000,000 in inventory and equipment accounts indicating the necessity of pushing financial reorganization plans. The company has a funded indebtedness of $550,000, and has $1,000,000 in preferred stock outstanding. Its notes amount to $670,000. Stockholders were asked sometime ago to trustee their stock. Committees, studying plans for reorganization, are headed by Col. Richard J. Goodman for the preferred stock holders, and Nelson Smith for the common stockholders. The form of refinancing has not been decided.

Lathe Builders Adopt Guaranty Clause

A standard guaranty clause, effective July 1, has been adopted by the Lathe Group of the National Machine Tool Builders' Association. It reads as follows: "The Blank Co. guarantees each machine tool built by it to be free from defective material or workmanship for a period of six (6) months from date of shipment from its works, when given normal and proper usage and when owned by the original purchaser." An additional clause has been adopted to prevent unreasonable service demands: "Should the purchaser of any machine built by this company desire an erector or demonstrator to come to his plant either to erect or to demonstrate the machine, such service will be rendered at a charge of ..... per day, plus all other expenses incident thereto, including railroad fare, hotel bills, etc."

It has been found necessary to make the above regulations because many careless or unfair buyers have been making unreasonable demands for service and repairs. It was recognized that if the satisfying of unfair demands is included in the cost of all lathes produced, the fair buyer is unfairly discriminated against and is expected to pay for a service rendered to others. The per diem rate charged for service men is a matter of individual discretion, but a survey of practice shows that the usual rate is $15 plus expenses.

The Business Barometer

The outlook in Commerce, Finance, Agriculture and Industry

By THEODORE H. PRICE

Editor, Commerce and Finance, New York

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WHEN the Stock Exchange reopened last Monday there was much to warrant the belief that the boom had reached its climax and that a period of orderly liquidation would ensue. This belief was encouraged by an advance in interest rates which carried call money to 6½ per cent as well as by the gold exports and the relatively small decrease in brokers' loans. But on Tuesday morning it was rumored that the Chrysler Company and the Dodge Co. were to be consolidated, and the confirmation of these rumors on Tuesday evening gave a fillip to the market on Thursday and Friday that has led many to predict a revival of speculative activity and a further advance in prices.

Of course the Dodge-Chrysler deal has fired the imagination of a public that was already excited and it may cause a fresh flare up, but the whole cannot exceed the sum of all its parts, and the mere fact of consolidation does not add anything to the value of the properties consolidated. Time will be required to prove that the advantages claimed can be realized, and it remains to be seen whether the market will be self-sustaining meanwhile.

As to this opinions are valueless, but it can hardly be denied that the trend of events seems against any further advance in prices. Gold exports are likely to continue. No important relaxation in the money market is expected. Railroad earnings for April show a decrease of over 5 per cent in both net and gross. Car loadings for the week ending May 19 are 2½ per cent under last year and 3½ per cent less than in 1926. The Federal Reserve Board reports a decrease in both wholesale and retail sales during April. The steel industry seems to be slackening despite the optimism of the trade papers. The action of the Consolidation Coal Co. in shutting down its less productive mines is likely to be widely followed. The textile industry, including both the cotton and the woolen mills, is still complaining of overproduction, and copper is about the only commodity for which the demand appears to exceed the supply.

It is hard to explain this sub-normalcy in a country that is supposed to be so rich and prosperous, but many bankers are disposed to attribute it to the nation's pre-occupation in the stock market and, if they are right, a revival of trade activity is not to be expected until the speculative activity subsides.

In the news from overseas China still holds first place, and the cables seem to indicate that the Nationalists are likely to succeed in their efforts to capture Peking. Japan is looking on meanwhile and those who understand the Far East think that her patience will be rewarded by the opportunities to extend her trade that she will find in the demoralization of China. This view is reflected in the recovery of the yen and recent advances in Japanese securities.

From Europe a further improvement is reported, although Lancashire continues to complain of the depression in its textile industry which seems to be suffering from the overcapitalization that followed the war. A drastic reduction in wages is talked of and many corporate reorganizations will probably be necessary.

The United States Department of Commerce has issued what might be called "America's International Balance Sheet" for 1927. It is an effort to set forth all the invisible as well as the visible items that arise from our dealings with the rest of the world, and it is very interesting although absolute accuracy is not claimed for it. Briefly it shows that our excess of merchandise exports which amounted to $680,000,000, was more than offset by our tourists' expenditures abroad and the amounts we pay Europe for freight and other services.

It is also claimed that our foreign loans are partly counterbalanced by the investments that Europe is making here as well as by the remittances on account of the war debt, and upon this theory it is argued that our net export of capital is smaller than is generally supposed.

This is probably true but it cannot be conclusively proven, although the steadiness of the foreign exchange market indicates that our receipts from abroad are about equal to our remittances, including the gold that we are shipping from time to time. Therefore, this gold represents the capital that we are exporting and as it goes out our credit base will be contracted. For this reason it is worth noting that the reserve ratio of the federal reserve system is now down to 68.9 as against 76.8 at this time last year.

Another consideration that should be borne in mind is Wall Street's belief that President Coolidge will be "drafted" and compelled to run again. This review is not intended to be political but it is undeniable that big business will be keenly disappointed if any one else is nominated at Kansas City, and the speculative markets will probably mark time until the Convention has acted.

The idea that business is always bad in a presidential year is, however, a mistake and unless money gets so tight that trade will be cramped there is no reason why it should not improve when the harvests are gathered and the stock market settles down.

WHAT'S DOING IN INDUSTRY

IN ONLY two centers from which reports were received this week, was there an indication that business in machine tools and allied lines dropped off in the month of May as compared to April. In New York, a dealers' market, although a decline had evidently taken place, a spirit of optimism prevails and it is not believed that the peak has been passed and the downward swing started. In the other center referred to, Detroit, Ford purchases are maintaining the market at a normal level, although orders from general sources have declined in volume. Out there, the Chrysler-Dodge merger is the talk of the town, as the industry will probably be affected to some extent.

SATISFACTORY conditions are reported in Cincinnati, Chicago, Cleveland and Milwaukee. In Philadelphia an upward trend is still apparent, while in Buffalo long delayed buying has made May the best month in some time. In New England, a slight improvement of May business over that of April is noted.

EVERYWHERE employment in the metal-working shops is at a high level, and in some centers, such as Cleveland and Cincinnati, skilled workers are at a premium.

RAILROAD buying is begining to show improvement, particularly in New England, and some of the roads near New York are showing signs of activity in the purchase of machine tools. Automotive buying is beginning to taper off, but aeronautical engine shops still keep up a steady flow of orders for equipment. Electrical equipment manufacturers also furnish a good market. In all centers, single tools bought to replace obsolete equipment dominate the market.

The Industrial Review

Weekly progress of the machinery and machine tool business

THE following reports, gathered from the various machinery and machine tool centers of the country, indicate the trend of business in these industries and what may be expected from the future.

CINCINNATI

While a small number of machine tool manufacturers in the Cincinnati district report a slight increase in sales in the past week, the majority report that their volume of business was at about the same level as in the previous week. Selling agents report an increased volume of sales in the week and state that market conditions are improving in local and adjacent territory.

While here and there was an order for two or three tools, by far the greater portion of the week's business was made up of orders for single tools and replacements from well scattered sources. Sales were well diversified in the matters of sizes and types. A few scattering single orders were received from railroads and concerns in the automotive industry.

Manufacturers report that inquiries held up well during the week. The greater part of these came from general machinists and miscellaneous users in all sections of the country. Selling agents report that in the week they received an increased number of inquiries.

Manufacturers maintained production at its usual level during the week and it is not thought that there will be any necessity of reducing output in the near future.

CLEVELAND

The local machinery and machine tool market is stationary at a high average level according to the majority of manufacturers and dealers interviewed. Sales in the month of May equaled in volume those of the last two months. The market is spotty, however, to the extent that not everyone shared in the general prosperity, but an optimistic feeling is much in evidence. Automotive and accessory manufacturers lead in the volume of purchases, but many diversified lines make up the bulk of the trade.

Inquiries continue to hold up well, and it is expected that June will also prove a good month, but that the summer months will show their usual dullness.

The Thompson Products Co. has recently received bids for a $50,000 factory addition, and new tools will be required for this extension. The construction of two new high schools has also been authorized by the Cleveland Board of Education, and about thirty tools will be required for each building.

Employment is on the increase in the machine tool line; in fact, there is a scarcity of the better grade of men.

PHILADELPHIA

The upturn in the machinery and machine tool business and in general industrial lines continued to be apparent throughout the Philadelphia market during the last two weeks. Dealers in metal-working machinery had orders from general industrial lines in a well scattered area throughout the mid-section of the country, the orders including lathes, planers, small engines, and equipment used generally by builders.

Inquiries were in rather substantial numbers and bore a hopeful tone for early orders. So far as could be ascertained, buying in this market from the automobile centers and from airplane producers was restricted, although a few inquiries were received. The Post Office Motor Vehicle Service Department, located in Philadelphia, has received orders to build 125 mail trucks for the government service, according to Robert S. Lafferty, superintendent of that service here. The trucks will be for the service in cities within 100 miles of Philadelphia, except New York City.

The Pennsylvania State Employment offices has received requests for molders, pattern makers, tool and die makers and other workers from the General Electric Co., J. H. Brill & Co., car builders, the Westinghouse Electric & Manufacturing Co., and other concerns throughout this area.

MILWAUKEE

The beginning of June finds the local metal-working equipment trade in a relatively satisfactory situation with respect to orders and to prospects for new business as well. The outlook is for a further continuance of output at the recent level, for the character of buying in recent months has been such that there have been no sharp peaks and valleys in the production curve. Orders have not embraced any large lots, deliveries of which leave a large hole to fill, but there has been a fairly steady demand that has enabled shops to maintain factory organizations intact.

Orders emanate from widely diversified sources and continue to reflect the effort of plants to keep abreast of new developments contributing toward high production efficiency. In this locality metal-working shops as a rule are doing very little new construction of major importance, but are gaining capacity by the installation of the latest types of tools to replace obsolete or worn-out euipment. Consequently, the volume of tool business is attributable to a very large extent to replacement demand.

Metal trades plants report sales increasing slowly, but steadily, and the business situation generally is improving, so that in view of other factors, the tool trade does not look for a marked slackening during the summer months. Employment is favorable and labor is well employed. More men are at work in Milwaukee factories than a year ago, according to official reports.

DETROIT

Speculations of machinery and machine tool dealers in the district have been confined, for the past few days, to the deal by which the Chrysler Corporation absorbed Dodge Brothers, Inc. While it is realized that there can be no immediate effect of the transaction on the machinery trade, there is still a tremendous interest in the deal and it is generally felt that big developments may quite naturally be expected within the coming year.

In general there is a slight let-down except in some fields of specialized equipment. The Ford Motor Co. is buying consistently and acts as a general balancer for the decline in general business. Graham-Paige is buying as are Chevrolet and a few others. One machinery manufacturer has just received an order for 69 machines, at a total cost of about $250,000, to be used in turning out an automobile axle. All the machines involved are for fast work, and in some instances it is expected to cut present manufacturing times to one quarter. This equipment is all for immediate delivery.

Most of the small shops have slowed up in their buying. The manufacturers of perishable tools, such as drills and grinding wheels are still busy, but the fixture men have run into a dead spot. It is generally felt that the big business of the past few months has come to a temporary end, at least for the summer.

General business conditions are very good, employment is still increasing and there is every prospect of a prosperous summer.

NEW ENGLAND

A continued strong demand for a large variety of small machinery and machine tools has been the outstanding feature of the market in the New England section throughout the month of May. For this reason the total sales volume will show a small, but distinct improvement over the month of April. The automotive, aeronautical and electrical industries continued on full schedules and were the chief buyers in this district. A number of builders, however, found automotive buying less pronounced during May than April. Improved demand from a diversified number of industries, and a better tone to New England railroad buying has made up the difference. Machine tool trade to date according to representative manufacturers and dealers is from 5 to 25 per cent improved over that reached during a similar period last year.

During the current week no action was noted on impending railroad lists. Sales of used equipment held up well and included deals for grinding units, presses, bench tools, and contractors equipment. Inquiry for new machinery during the past few days has been light with no large lists reported.

CHICAGO

The volume of trade in machine tools for the month of May compares favorably with that of April according to opinions expressed by those who keep in close touch with the machinery market. Business on the whole has been satisfactory. With one exception, no specialized manufacturing industry has especially contributed to the conditions that have prevailed during the month, the exception being the farm implement and tractor producers, whose plants have been kept exceptionally busy in meeting the requirements of agriculturists.

Railroad demand has proved somewhat disappointing in that orders placed by the Western roads have fallen considerably short of what had been expected, although buying is better here than in other sections of the country. General industry has been the main stay of the machine tool business, having provided the greater part of the year's trade up to date. The belief prevails that railroad buying will take an upward turn in the near future, some of the roads, the Burlington in particular, being reported as about to enter the market with supplementary or new lists.

Inquiries for used tools continue in considerable number, but closing drags. Manufacturers of hack saws and band saws report business has having been brisk since the first of the year and as continuing on the same good level.

BUFFALO

There was a marked upward turn in machine tool trade during the last half of May, Buffalo dealers report. This situation was due to the fact that many orders that had been pending for months had suddenly been closed. Optimism is prevalent, and it is expected that June also will turn out to be an exceptionally good month. Many report May the best month of the year

as far as volume of orders go, and a few report it the best month in a year and a half.

There is a large volume of business being placed in the contractors' equipment field, May being the best month this year, and with the prospects of June being as good. This large volume of sales is being obtained on a price basis, however, thus detracting from what normally would be a very profitable trade.

The electrical industry reflected to a certain extent the activity in the machine tool field, but not proportionally. Judging from the buying that is taking place in general industry, however, there seems to be a greater feeling of security among industrial manufacturers than at any time this year.

NEW YORK

As was anticipated in last week's letter, now that the month is over, May business in machine tools has been lower than that of April for nearly all dealers and factory representatives. For the large dealers the dropping off has been slight, but noticeable, while for some it has been a relatively large amount. For one concern, on the other hand, there was an actual increase in the number of orders placed. In every instance a spirit of optimism prevails, and no one feels that the decline will be continuous. There is much business pending and inquiries continue to be received in fair volume.

The General Electric Co. continues to lead in the number of inquiries issued and of orders placed. The Wright Aeronautical Corporation, long a leader in purchases, bought two tool grinders in the past week and is in the market for additional equipment. The New York Central R.R. bought some grinder stands and sent out some inquiries, some reissued after some months, another new one for a lathe. The new Brunswick Board of Education is in the market for a shaper, a lathe and a drill press. The Fairchild-Caminez Co. has inquired for a grinder, an engine lathe, a speed lathe, and a drill press. The Chesapeake & Ohio R.R. requires a 42-in. cold saw, while the Newport News Drydock Co. is in the market for an 11-in. lathe, a grinder and a drill. In the past month the Nairn Congoleum Co. also issued a list of tools for a new plant.

Among the tools sold in this market in the past week were two Swiss jig borers, three Edlund drills, one Robertson power hack saw, two 20-in. Barnes drills, two 20-in.x10-ft. engine lathes, five Ramson grinders, a 16-in. Simplex shaper and a 24-in. crank slotter. The last two items were for consignment outside this territory.

During the week the Pratt & Whitney Co. sold the following tools to points within the United States: One No. 2 jig borer, two No. 2 die sinkers, two 14-in. vertical surface grinders, a thread miller, a 6-in. vertical shaper, three Sigourney drills and two 13x30-in. lathes. An electrical company in the West bought seven 13x30-in. lathes and two 16x36-in. lathes.

Except for a few small orders placed by the New York Central, railroad buying in this market remains dull, but some improvement is expected. Chicago has been the best market for this class of tools for some time, it is reported, and New England is about to assume first place. Sales of large machine tools are still disappointingly slow. Small tools, including electrical drills and grinders, however, continue to sell in volume.

Rating the Day's Labor in a "Basket of Provisions"

Compared with Europeans, the American's dinner pail is overflowing

THE International Labor Bureau at Geneva, an affiliation of the League of Nations, has investigated the food basket of the 48-hour a week workers in the engineering and other trades in certain European capital cities with a view to finding out how they compare one with another in cost reckoned in the value of a day's labor. Instead of a wage standard it has adopted the "basket of provisions" as the unit—a basketful of provisions of defined quantities of certain food stuffs commonly currently consumed by the workers in a week, assuming that normally this basket of provisions is an adequate supply for a day's nourishment of the workingman's family of four.

The object is to show how many units of these collective food stuffs may be bought for the wage normally earned. On the basis of a family of four, as in France, the ration is supposed to be amply sufficient. If, as in Italy and Germany, the family reaches larger proportions the same supplies will naturally give a less abundant nourishment.

In the absence of a really adequate international standard of life which may be applied class for class the method suggested certainly has merit, giving due consideration that from the American point of view the worker in the United States is manifestly better off than most of his fellows of Europe. Immigration of European workers to the United States has ever been based on the fundamental prospect of improving the individual's *material* condition over what it was in his homeland, other political and social conditions apart.

The make-up of this basket of provisions is as follows, the weight unit being the kilogram, or 2.2. pounds.

The weekly wage of the Stockholm worker will buy 8.2 baskets: i.e. rather more than one a day—potatoes, eggs and milk being his chief bulk. London workers may buy 8.9 baskets, which is rather better but they run up on beef, mutton and bacon, as with sugar and with tea—the only instance where tea is taken into consideration. The Vienna worker may buy 7.17 baskets, he of Berlin, 7.16 baskets and those of Riga but 5.4 baskets. The only comparison made with America was to the effect that the metallurgical worker in the Philadelphia district might buy from his weekly wage 16 baskets such as these, even supposing that the cost of the ingredients was more. And that is just the point of the computations which have been arrived at; the quantities are directly related in their cost to the wage scale and accordingly those of central and south Europe represent low priced provender.

What the Bread Basket Contains

	Belgium France	Great Britain	Central Europe	South Europe	Scandinavia
White bread	4.50	2.10	0.50	2.50	0.40
Rye bread	....	....	3.00	....	1.20
Wheat flour	0.25	1.25	0.30	1.00	1.45
Butter	0.24	0.17	0.10	0.10	0.22
Margerine	0.08	0.05	0.12	0.05	0.15
Beef	0.50	0.50	0.25	0.40	0.21
Mutton	....	0.20	0.05	0.10	0.02
Bacon or pork	0.20	0.12	0.11	0.12	0.21
Potatoes	3.00	1.50	4.50	0.75	2.30
Sugar	0.35	0.60	0.25	0.18	0.63
Coffee	0.20	0.01	0.13	0.06	0.13
Tea	....	....	....	....	....
Cheese	0.10	0.08	0.10	0.10	0.30
Eggs	3.00	2.75	2.00	3.00	3.10
Milk	1.70	1.20	2.50	1.50	6.40
Rice	0.06	0.13	0.40	0.50	0.23

Industrial Advertisers' Program Announced

The complete program of the seventh annual conference of the National Industrial Advertisers Association, to be held at the Hotel Chase, St. Louis, Mo., June 11-13, has been designed by its sponsors as a 3-day course in industrial marketing. As announced in last week's issue, the keynote address will be on the question, "Can Industrial Advertising Reduce Industrial Selling Cost—and How?" and will be delivered by W. W. Galbreath, president, Youngstown Pressed Steel Co. This speech will feature the morning session of the first day and in fact will dominate the entire conference. Most of the scheduled speakers will attempt to answer this question and to restate their faith in advertising through the concrete expression of their collective experiences.

Some of the speakers and their subjects are: George D. Crain, Jr., publisher of *Class* and *Industrial Marketing*, "Advertising as a Spur to Industrial Marketing"; G. W. Morrison, Ingersoll-Rand Co., "The Part Advertising Plays in the Marketing of a Technical Product"; A. T. Hugg, advertising manager, Detroit Steel Products Co., "The Importance of Industry in Industrial Advertising"; J. A. Demarest, vice-president, Credit Alliance Corporation, "The Relation of Installment Sales to the Merchandising of Machinery"; H. H. Ruhwedel, Jeffery Manufacturing Co., "How Business Paper Advertising Can Sell the Products to Executives"; and H. C. Miller, president, Dodge Manufacturing Corporation, "The Effect of Advertising on Cost."

Other speakers and their papers are: Sherman Perry, American Rolling Mill

Co., "How a Basic Industry Is Co-operating in Marketing Its Product"; A. B. Little, formerly advertising manager, Thew Shovel Co., "When the Bunk Was De-Bunked"; J. S. Pollard, Jr., Harvard Graduate School of Business Administration, "Research in Industrial Advertising and Marketing." A report on domestic marketing problems will be presented by G. H. Corey, Cleveland Twist Drill Co., and F. R. Davis General Electric Company.

At the annual business meeting to be held on the morning of June 12, J. R. Hopkins, president of the Association, will deliver his annual address, followed by the report of the secretary-treasury, H. von P. Thomas. Breakfast round-table discussions will feature the conference, at the first, W. W. Rastall, chief of Industrial Machinery Division, Bureau of Foreign and Domestic Commerce, will give "The Latest News From Washington." At the second, the subject of publications will be discussed.

During the conference an exhibit of advertising panels will be on display, and awards will be made for excellence in ten divisions.

Auto Production Declines

Production of automobiles in May will show only a slight decline from the high production totals of the two previous months, increasing output of Ford cars largely making up for the reductions by other makers. The same general condition is expected to govern the automotive manufacturing situation in June, most plants reducing output with the closing of the quarter and Ford increasing to meet the heavy accumulated demand built up during the past year.

Personals

M. MIDDLETON has been appointed Philadelphia representative of SKF Industries, inc., of New York, to succeed A. D. Shaw, resigned.

H. G. OSTERHOLM has been appointed representative of the Curtis Pneumatic Machinery Co. in Ohio, western Pennsylvania, and western New York.

FRANK M. SMALL has been appointed director of safety and employment of the Hydraulic Pressed Steel plant, at Cleveland, Ohio, of the Truscon Steel Co., of Youngstown.

W. PARKER, director of sales, British Furnaces, Ltd., is now traveling in this country studying industrial furnaces used here. The English firm represents the Surface Combustion Co., of Toledo.

A. H. DEUTE, New York, has been elected vice-president of the Billings & Spencer Co., Hartford, Conn., to succeed the late Arthur W. Fox. Mr. Deute was formerly with the Borden Company.

F. C. ALLEN, JR., founder and former president of Allen & Billmyre Co., Inc., is now president of the Allen Air Appliance Co., of Glens Falls, N. Y. The company makes turbo blowers and vacuum cleaners.

KENNETH H. CONDIT, editor of *American Machinist*, sailed on the S. S. Cedric for Europe on June 2. He will spend two months visiting industrial centers in England, France, Belgium, Germany, Switzerland and Czechoslovakia, and in observing conditions in the machinery industries there.

LESTER D. GARDINER, until recently owner and publisher of *Aviation*, has been elected president of Aeronautical Industries, Inc. He is a director of the Aeronautical Chamber of Commerce.

SAMUEL A. CURRY has been appointed superintendent of inspection and test at the South Philadelphia Works of the Westinghouse Electric & Manufacturing Co., as recently announced. Mr. Curry, who was field engineer and turbine test engineer, fills the position made vacant by the recent accidental death of John T. Snyder. U. A. Taddiken, formerly a member of the condenser engineering department, was appointed to the position made vacant by Mr. Curry.

ROBERT GREGG, president of the Atlantic Steel Co., Atlanta, and Bryan Blackburn, R. D. Cole Manufacturing Co., Newnan, Ga., machinery manufacturers, have been re-elected members of the board of directors of the Georgia Manufacturers Association for the coming year. Other prominent machinery manufacturers elected directors include H. A. Dean, Towers & Sullivan Manufacturing Co., Rome; T. E. Golden, Golden's Foundry & Machine Co., Columbus; Horace Lanier, West Point Iron Works, West Point; J. S. Schofield, J. S. Schofield & Sons Co., Macon.

Business Items

The Gogan Machine & Foundry Co., 1440 E. 55th St., Cleveland, is to become the Gogan Machine Co. on July 1 and will discontinue its foundry business. The company manufactures heat-treating equipment.

The Builders & Industrial Supply Co., 4090 Detroit St., Toledo, Ohio, has been appointed distributor of the Adamant fire brick cement and gun and Adachrome products of the Botfield Refractories Co., of Philadelphia.

Letters of incorporation have been granted to the Accurate Tool & Die Co., 970 Montana St., Chicago, to manufacture and deal in tools and dies and do general machine work. The incorporators are: H. A. French, Cora M. French, J. F. Glazer, Lilian Glazer and B. L. Caltzman.

The Northern Engineering Works, of Detroit, makers of cranes and hoists, recently appointed the Interstate Supply Co., Commercial Trust Bldg., Philadelphia, direct factory representative in the Philadelphia district. W. H. Beyer is to have charge of the account.

The National Supply Co., of Delaware, which has general offices at Toledo, has taken over the Superior Gas Engine Co., of Springfield, Ohio, and its subsidiary the Superior-Otto Engine Works of Philadelphia. P. J. Shouvlin, the founder of the Gas Engine company, remains as manager of that unit.

The Gulf States Machine Supply Co., Port Arthur, Tex., distributors of machinery, machine tools and parts in that section of the southwestern territory, has announced the recent incorporating of the company and plans for expanding the territory covered. The company is headed by A. Grossman.

The New Britain Machine Co., New Britain, Conn., has called for redemption on July 1 of one-third of the outstanding Class A preferred stock valued at $500,000 and called at $105. This leaves $1,000,000 outstanding of this stock. The accumulated dividends on this stock have been paid, all of which reflects the improvement of the company's financial status.

The Walsh & Weidner Boiler Co. and the Casey-Hedges Co., both of Chattanooga, Tenn., operating two of the largest foundry and machine shop plants in the Tennessee territory for the manufacture of boilers, etc., have been merged under the name of the Hedges, Walsh & Weidner Co., with M. M. Hedges as president. The two plants will be operated as separate units.

The Heil Co., Milwaukee, manufacturer of steel dump bodies, tanks, etc., has effected a consolidation with its subsidiary, the Hydro-Hoist Co., also of Milwaukee, manufacturing hydraulic hoists for dump body motor trucks, and the merged corporation has been recapitalized with 75,000 shares of common stock without par value, in place of a capital of $250,000 of the Heil Co. and $100,000 of the Hydro-Hoist Co. Of the new capital, 59,892 shares, with a value of $1,700,000, are outstanding, the remainder being held in the company's treasurer. Clement C. Smith, president of the company, has been elected chairman of the board, and Julius P. Heil, vice-president and treasurer, has been elected president and treasurer. Herman W. Falk, who is president of the Falk Corporation, Milwaukee, has been elected vice-president. W. M. Chester continues as secretary.

Obituaries

JOHN B. THOMAS, who has been identified with the Westinghouse Electric & Manufacturing Co. for the past 52 years, died in Pittsburgh recently. At the time of his death, he was assigned to special duty with the company.

HENRY J. CASSADY, pioneer hardware manufacturer, died in Chicago on May 28, aged 71. Mr. Cassady started in business as an employee of Hibbard, Spencer, Bartlett & Co. Later he became manager of mills for the Federal Manufacturing Co. and in 1905 became president of the Cassady-Fairbanks Manufacturing Co. He was also connected with the Jefferson Electric Co. and the Steel Car Company.

Forthcoming Meetings

American Railway Association. Schedule of sectional meetings: Division V, mechanical, June 20 to 27, Atlantic City, N. J.; Division VI, Purchases and Stores, June 20 to 22, Atlantic City, N. J.; Division VII, Electrical, Sept. 22 to 28, Cleveland, Ohio. J. W. Welsh, secretary, 292 Madison Avenue, New York City.

Association of Iron and Steel Electrical Engineers. Annual meeting, Stevens Hotel, Chicago, June 25 to 29. J. F. Kelly, managing director, Empire Bldg., Pittsburgh, Pa.

American Society for Testing Materials. Annual meeting, Chalfonte-Haddon Hall, Atlantic City, N. J., June 25 to 29. C. L. Warwick, secretary, 1315 Spruce St., Philadelphia, Pa.

Society of Automotive Engineers. 1928 Summer Meeting, Chateau Frontenac, Quebec, Canada, June 26 to 29. C. E. Heywood, in charge of meetings, 29 West 39th St., New York.

Canada's Steel and Power Show. Second annual show to be held at the University of Toronto Arena, Sept. 4-7. Secretary, Campbell Bradshaw, 24 Front St., Toronto, Ontario.

American Railway Tool Foremen's Association. Annual meeting, Hotel Sherman, Chicago, Sept. 12, 13 and 14. G. G. Macina, secretary, 11402 Calumet Ave., Chicago.

American Railway Tool Foreman's Association. Sixteenth annual convention of the Supply Association, Hotel Sherman, Chicago, Sept. 12, 13 and 14. F. A. Armstrong, secretary, the Pratt & Whitney Co., 564 W. Monroe St., Chicago.

National Safety Council. Seventeenth annual safety congress will be held in New York, October 1-5. Idabelle Stevenson, executive secretary, 1 Park Ave., New York.

American Society for Steel Treating. "National Metals Exposition," Commercial Museum, Philadelphia, Pa., week of Oct. 8. W. H. Eisenman, secretary, 4600 Prospect Ave., Cleveland, Ohio.

American Gear Manufacturers Association. Semi-annual meeting, Statler Hotel, Buffalo, N. Y., Oct. 11-13. T. W. Owen, secretary, 3608 Euclid Ave., Cleveland, Ohio.

The Weekly Price Guide

Rise and Fall of the Market

BARS, shapes and plates are selling now at $1.85 per 100 lb., Pittsburgh, in large mill lots; $1.90 is asked, however, for third quarter requirements. Buying of steel for immediate needs only is the rule in the present market; tendency to purchase ahead was evident during the first quarter this year and the last quarter in 1927. Steel mill operations are at approximately 80 per cent of capacity, a drop from last week's rate of 82 per cent. The decline is almost wholly seasonal since mill operations averaged 80 per cent during the last week in May, 1927. Tin plate mills are operating at a higher rate than any of the other steel products owing to packing demand; prices remain steady as usual. Steel plates and pipe for buildings and oil lines are in especially active demand. Fabricated brass and copper, also scrap copper prices tend upward. Japanese washed, white wiping cloths rose 1c. per lb. in New York during the week.

(All prices as of May 31, 1928)

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b.:

CINCINNATI	
No. 2 Southern	$21.44
Northern Basic	20.89
Southern Ohio No. 2	21.19
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	25.62
BIRMINGHAM	
No. 2 Foundry	16.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	21.76
Virginia No. 2	27.17
Basic	21.26
CHICAGO	
No. 2 Foundry local (silicon 1.75@2.25)	20.00
No. 2 Foundry, Southern (silicon 2.25@2.75)	22.80
PITTSBURGH, including freight charge ($1.76) from Valley:	
No. 2 Foundry	20.26
Basic	19.26
Bessemer	21.26

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	4.50@4.75
Cleveland	5.00
Cincinnati	4.30
New York	5.25
Chicago	4.50@4.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots.

Blue Annealed	Pittsburgh Mill Base	Chicago	Cleveland	New York
No. 10	2.00@2.20	3.50	3.25	3.90*
No. 12	2.05@2.25	3.55	3.30	3.95*
No. 14	2.15@2.30	3.60	3.35	4.00*
No. 16	2.25@2.40	3.70	3.45	4.10*
Black				
Nos. 18 to 20	2.70@2.80	3.75	3.55	4.00
No. 22	2.85@2.95	3.90	3.70	4.15
No. 24	2.90@3.00	3.95	3.75	4.20
No. 26	3.00@3.10	4.05	3.85	4.30
No. 28	3.15@3.25	4.20	4.00	4.45
Galvanized				
No. 10	2.90@2.95	4.10	3.80	4.25
Nos. 12 to 14	3.00@3.05	4.20	3.90	4.35
No. 16	3.10@3.15	4.30	4.00	4.45
No. 18	3.25@3.30	4.45	4.15	4.60
No. 20	3.40@3.45	4.60	4.35	4.75
No. 22	3.45@3.50	4.65	4.40	4.80
No. 24	3.60@3.65	4.80	4.50	4.95
No. 26	3.85@3.90	5.05	4.75	5.20
No. 28	4.10@4.15	5.30	5.00	5.45

*250 to 3,999 lb.

WELDED STEEL PIPE—Warehouse discounts are as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in., steel, butt welded.	53%	39%	55½%	43½%	54%	41%
2½ to 6 in., steel, lap welded.	48%	35%	53½%	40½%	51%	38%

WROUGHT-STEEL PIPE LIST

Size, Inches	List Price per Foot	—Diameter in Inches— External	Internal	Thickness Inches
1	$0.17	1.315	1.049	.133
1¼	.23	1.66	1.38	14
1½	.27½	1.9	1.61	.145
2	.37	2.375	2.067	.154
2½	.58½	2.875	2.469	.203
3	.76½	3.5	3.068	.216
3½	.92	4.0	3.548	.226
4	1.09	4.5	4.026	.237
4½	1.27	5.0	4.506	.247
5	1.48	5.563	5.047	.258
6	1.92	6.625	6.065	.28

SEAMLESS STEEL TUBING—Following net prices are for seamless mechanical tubing, cold drawn, round, .10 to .30 carbon, at New York warehouse in lots of less than 100 ft. or 100 lb.:

——Thickness—— Decimal	B.w.g. and Fractions	Outside Diameter in Inches ½	⅝	¾	⅞	1	1⅛	1¼
		Price per Foot						
.035″	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23
.049″	18	.17	.18	.19	.20	.21	.23	.25
.065″	16	.19	.20	.21	.22	.23	.25	.27
.083″	14	.20	.22	.23	.24	.25	.27	.29
.095″	13	.21	.23	.25	.26	.27	.29	.31
.109″	12	.22	.24	.26	.27	.28	.30	.32
.120″ or .125″	11	.23	.25	.27	.28	.29	.31	.33
.134″	10	.24	.26	.28	.29	.30	.32	.34

MISCELLANEOUS—Warehouse base prices in cents per lb.:

	New York	Cleveland	Chicago
Spring steel, light*	4.50	4.65	4.65
Spring steel, heavier	4.00	4.00	4.00
Coppered Bessemer rods	6.05	6.00	6.20
Hoop steel	4.50‡	4.00	4.15
Cold rolled strip steel	6.25	6.00	6.10
Floor plates	5.10‡	5.30	5.00
Cold drawn, round or hexagon†	3.40	3.65	3.60
Cold drawn, flat or square†	3.90	4.15	4.10
Structural shapes	3.30‡	3.00	3.10
Soft steel bars	3.25‡	3.00	3.00
Soft steel bar shapes	3.25‡	3.00	3.00
Soft steel bands	4.00‡	3.65	3.65
Tank plates	3.30‡	3.00	3.10
Bar iron (2.75 at mill)	3.24	3.00	3.00
Drill rod (from list)	60%	55%	50%

*Flat, 3/16@½-in. thick. †Cold finished steel, shafting and screw stock. ‡250 to 3,999 lb., ordered and released for shipment at one time.

Electric welding wire, New York, 3/32, 8.35c.; ⅛, 7.85c.; 5/32 to ¼ 7.35c. per lb.

METALS

Warehouse Prices in Cents Per Pound for Small Lots:

Copper, electrolytic, New York			15.25
Tin, straits, pigs, New York			53.00
Lead, pigs, E. St. Louis	6.20	New York	7.00
Zinc, slabs, E. St. Louis	6.15	New York	7.00

	New York	Cleveland	Chicago
Antimony, slabs	13.50	13.25	14.25
Copper sheets, base	23.25	23.00	23.25
Copper wire, base	19.62½	19.62½	16.25*
Copper bars, base	21.75	21.50	22.25
Copper tubing, base	24.75	24.50	24.75
Brass sheets, high, base	19.00	18.75	19.00
Brass tubing, high, base	23.87½	23.62½	23.87½
Brass rods, high, base	16.75	16.50	16.75
Brass wire, high, base	19.50	19.50	19.50

*At mill.

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Aluminum ingots, 99%.....	25.00*	22¾@24	24.30
Zinc sheets (casks).....	9½@10	10.75	9.36
Solder (strictly).....	33.75	32.50	31@34
Babbitt metal, delivered, New York, cents per lb.:			
Genuine, highest grade.....			70.75
Commercial genuine, intermediate grade.....			53.00
Anti-friction metal, general service.....			31.50
No. 4 babbitt (f.o.b.).....			12.00
Nickel, f.o.b. refinery, Bayonne, N. J., cents per lb.:			
Ingots..... 35.00	Electrolytic.. 37.00	Shot.....	36.00

*Delivered.

SPECIAL NICKEL AND ALLOYS—Price in cents per lb., f.o.b. Huntington, W. Va.:

Full finished nickel sheet (base).....	52.00
Cold rolled nickel sheet (base).....	60.00
Hot rolled rods, Grade "A" (base).....	45.00
Cold drawn rods, Grade "A" (base).....	53.00

Base price of Monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot.....	28.00	Hot rolled rods (base)...	35.00
Blocks.....	28.00	Cold drawn rods (base)..	43.00
Cold rolled sheets (base)	50.00	Full finished sheets (base)	42.00

OLD METALS—Dealers' purchasing prices in cents per pound, f. o. b. cars, depending on quantity:

	New York	Cleveland	Chicago
Crucible copper.....	12.75 @13.00	11.50	11.25@11.75
Copper, heavy, and wire..	12.00 @12.75	10.75	10.75@11.25
Copper, light, and bottoms	10.62½@11.12½	9.50	9.50@10.00
Heavy lead.....	5.00 @ 5.25	5.25	4.25@ 4.75
Tea lead.....	3.75 @ 4.00	3.75	3.25@ 3.75
Brass, heavy, yellow.....	7.25 @ 7.50	7.25	7.00@ 7.50
Brass, heavy, red.....	9.50 @10.00	9.75	9.00@ 9.25
Brass, light.....	5.50 @ 6.00	5.75	6.00@ 6.50
No. 1 yellow rod turnings.	7.62½@ 8.12½	7.50	7.25@ 7.75
Zinc.....	3.25 @ 3.50	3.25	2.75@ 3.25

TIN PLATES—Charcoal—Bright—Per box.

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	14x20.....	$12.10	$11.95	$11.50
"A" Grade:				
IC,	14x20.....	9.70	9.90	9.50
	Coke Plates—Primes—Per box			
100-lb.,	14x20.....	6.45	6.10	7.00
	Terne Plates—8-lb. Coating—Small lots—Per box			
IC,	14x20.....	7.75@8.00	7.00	7.50

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.*	$0.10@0.13½	$0.16	$0.15
Cotton waste, colored, per lb.*	.09@ .13	.12	.12
Wiping cloths, washed white, per lb.....	.16½@.17½	38.00 per M	.17
Sal soda, per lb.....	.02	.02	.02¾
Roll sulphur, per lb.....	.027	.03½	.04
Linseed oil, raw, per lb. in 1 to 4 bbl. lots.....	111	112	.107
Cutting oil, about 25% lard, in 5 gal. cans, per gal....	.65	.60	.60
Machine oil, medium-bodied (55 gal. steel bbl.) per gal.....	.30	.36	.36
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 24c. per lin.ft. per inch of width for single ply			
Medium grade.....	35%	35%	35%
Heavy grade.....	30%	30%	30%
Rubber transmission, 6-in., 6 ply, $1.83 per lin.ft.			
First grade.....	45%	50–10%	50%
Second grade.....	50%	60–5%	50–10%

*All waste in bale lots.

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars.....	per lb.....	$0.0325	$0.0325	$0.0324
Cold drawn shafting....	per lb.....	.034	.034	.04
Brass rods.....	per lb.....	.1675	.165	.1587½
Solder (½ and ½).....	per lb.....	.3375	.335	.41
Cotton waste, white....	per lb.....	.10@.13½	.10@.13½	.10@.13½
Emery disks, cloth, No. 1, 6-in. dia.....	per 100...	3.10	3.10	3.10
Lard cutting oil.....	per gal...	.65	.65	.55
Machine oil.....	per gal...	.30	.30	.33
Belting, leather, medium.....	off list....	35%	35%	40–5%
Machine bolts, up to 1x30 in., full kegs....	off list....	50%*	50%*	50%*

*List prices as of April 1, 1927.

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials—Standard grade, in sheets 9x11 in., No. 1, per ream of 480 sheets:			
*Flint paper.....	$5.40	$4.95	$5.13
*Emery paper.....	10.71	9.15	10.71
†Emery cloth.....	27.84	27.85	27.84
Emery disks, 6 in. dia., No. 1, per 100:			
Paper.....	1.29	1.27	1.32
Cloth.....	3.10	3.05	3.05
Fire clay, per 100 lb. bag.....	1.00	.75	.75
Coke, prompt furnace, per net ton...	Connellsville,		2.25@2.50
Coke, prompt foundry, per net ton..	Connellsville,		3.25@3.75
White lead, dry or in oil...	100 lb. kegs....	New York,	13.25
Red lead, dry.....	100 lb. kegs....	New York,	13.25
Red lead, in oil.....	100 lb. kegs....	New York,	14.75

*4½ reams and under. †Less than 2 reams.

SHOP SUPPLIES

Discounts from new list dated Apr. 1, 1927, applying on immediate deliveries from warehouse stocks in New York and vicinity:

	Full Kegs or Cases
Machine bolts, square heads and nuts:	
Up to ¾ x 6-in.....	55%
Larger up to 1 x 30-in.....	50%
1⅛ and 1¼ in. dia.....	35%
Carriage bolts:	
Up to ½ x 6-in.....	55%
Larger sizes.....	50%
Coach and lag screws:	
Up to ½ x 6-in.....	55%
Larger sizes.....	50%
Tap bolts, hexagonal heads.....	40%
Nuts:	
Hot pressed, square and hexagonal, blank or tapped, up to 1-in., incl.....	55%
Cold punched, square and hexagonal, blank or tapped, up to 1-in. incl.....	55%
Semi-finished, hexagonal, tapped, in packages, all sizes.....	40%
Case hardened, hexagonal, tapped, in packages, all sizes.....	30%
Washers: Deduct from list, per 100 lb.....	$3.50*
Rivets, button and cone head:	
Small, including 7/16-in. dia.....	50–10%
Large (base) per 100 lb. net.....	$5.00†

Note—For less than case or keg quantities on bolts, screws, hot-pressed and cold-punched nuts, add extra of 10 per cent to list.
*Broken keg lots, $1.50 off list. †Broken keg lots, $6.50 net.

Machine Requirements and Industrial Construction

Equipment Wanted

Mass., Somerville (Boston P. O.)—J. M. Webster, 76 Boston St.—power shears to cut copper bars 4 x 1¼ in.

Mich., Ferndale—Steel & Tube Inc., 224 East 131st St., Cleveland, O.—machinery and equipment (later) for the manufacture of sheets and tubes for proposed 1 and 2 story plant. Estimated cost $500,000.

O., Lima—Ohio Steel Foundry Co., J. E. Galvin, Pres., (locomotive castings)—one 10 ton bridge crane and one 10 ton jib crane for proposed 1 story, 53 x 253 ft. foundry.

O., Steubenville — Steubenville Pressed Steel Co., E. M. Mentzer, Gen. Mgr.—machinery and equipment for fabricating steel and iron products.

Pa., Lansdale—F. M. Weaver & Co., Inc. —one 5 ton, 58 ft. span overhead electric traveling crane.

Pa., Pittsburgh—Pittsburgh Crucible Steel Co., Oliver Bldg.—one 25 ton electric crane with 5 ton auxiliary.

W. Va., Wierton—Wierton Steel Co.—overhead traveling crane for dock, stock-yard grab bucket crane, charging machine and billet stripper.

Ont., London—Imperial Oil Co., H. O. 56 Church St., Toronto, G. Bedggood, London, Mgr.—complete equipment for proposed 1 story, 50 x 50 ft. repair shops. Estimated cost $15,000.

Ont., New Liskeard—Standard Diamond Drill Co.—machinery and equipment for the manufacture of diamond drills for proposed 100 x 100 ft. factory. Estimated cost $25,000.

Opportunities for Future Business

Calif., Los Angeles—E. Halm, awarded contract for a 1 story, 100 x 200 ft. woodworking plant at 610-18 Avalon Blvd. Estimated cost $90,000.

Calif., Los Angeles—Hollywood Business Properties Inc., 6331 Hollywood Blvd., had plans prepared for a 13 story, 120 x 140 ft. garage at Vine St. and Hollywood Blvd. Estimated cost $700,000. K. MacDonald, Jr., Spring Arcade Bldg. Archt.

Conn., Hartford—Royal Typewriter Co., 150 New Park Ave., is having plans prepared for a 5 story, 70 x 190 and 70 x 70 ft. factory. Estimated cost $300,000. Greenwood & Noerr, 847 Main St., Archts.

Conn., Stratford—Baird Machine Co., will soon award contract for a 1 story, 100 x 150 ft. addition to machine shop. Estimated cost $75,000. Fletcher-Thompson Inc., 542 Fairfield Ave., Bridgeport, Conn., Archts. Noted May 10.

Conn., Torrington — Dayton Mfg. Co., manufacturers of auto accessories and supplies, had plans prepared for a 2 story factory.

Fla., St. Petersburg—The U. S. Hammer & Piston Ring Co., W. T. Baynard, 611 First Ave., Mgr. plans the construction of a new foundry and machine shop. Estimated cost $50,000.

Ill., Chicago — Chicago Metal Spinning Co., 1715 Walnut St., awarded contract for the construction of a 2 story addition to factory for the manufacture of metal specialties and stampings, spun lighting fixture parts and reflectors.

Ill., Chicago — Crane Co., 826 South Michigan Ave., awarded contract for a 82 x 502 ft. addition to factory for the manufacture of valves, fittings, etc. at 4100 South Kedzie Ave. Estimated cost $389,000. Noted Apr. 19.

Ill., Chicago—G. L. Holmes, c/o D. Meredith, 222 West Adams St., Archt., awarded contract for the construction of a garage at Lake and Dearborn Sts. Estimated cost $1,000,000. Noted Mar. 29.

Ill., Chicago—Sargent & Lundy, 72 West Adams St., awarded contract for a 1 story, 55 x 101 ft. garage at 228-30 Desplaines St. Estimated cost $50,000.

Ill., Chicago — Syndicate, c/o R. B. Kurzon, 105 West Monroe St., Archt., is having plans prepared for a 3 story, 140 x 202 ft. auto service building at Michigan Ave. and 26th St. Estimated cost $475,000.

Ill., Chicago—Youngstown Sheet & Tube Co., awarded contract for the construction of a 4 story factory at 2443 Kreiter Ave. E. Estimated cost $34,000.

La., Shreveport—P. M. Neilson-Herborg, Skjern, Denmark, plans the construction of a plant for assembling and manufacturing farm machinery here.

Mass., Boston—H. K. Noyes Buick Co., 857 Commonwealth Ave., will build a 3 story, 115 x 180 ft. repair and service garage at 25 St. Paul St. Estimated cost $200,000. Private plans.

Mass., Everett (Boston P. O.)—G. B. Torngren, 712 Broadway, is receiving bids for a 2 story factory on Garden St. Estimated cost $40,000. Private plans.

Mich., Ferndale—Steel & Tube Co., Inc., 224 East 131st St., Cleveland, O., plans the construction of a 1 and 2 story sheet metal and tube plant on Nine Mile Rd. here. Estimated cost $500,000. Private plans.

Mich., Grayling—U. S. Property & Disbursing Officer, Lansing, will receive bids until June 21 for the construction of a machine shop, warehouse, etc., here.

Mo., St. Louis—J. P. Fleming, 4460 Gibson Ave., is having preliminary plans prepared for a 6 story, 50 x 120 ft. garage at 3407 Washington Ave. Estimated cost $200,000.

N. H., Hanover—Bd. of Selectmen, is having plans prepared for a 2 story, 50 x 90 ft. service building. Estimated cost $50,000. Wells & Hudson, Archts.

N. J., Elizabeth—F. L. Smidth & Co., 50 Church St., New York, N. Y., is receiving bids for a 1 story, 20 x 50 ft. foundry on North Ave. Estimated cost $40,000. Private plans.

N. J., Kearny—Western Electric Co., 195 Broadway, New York, N. Y., had plans prepared for a 6 story, 200 x 300 ft. plant at Central Ave. and Lincoln Highway. Estimated cost $1,250,000. Private plans.

N. J., Lodi—Posner Bros., c/o A. L. Vecliante, 40 Passaic St., Garfield, awarded contract for a 1 story, 60 x 100 ft. factory here. Estimated cost $40,000.

N. J., Livingston—De Camp Bus Lines Inc., Livingston Ave., will build a 1 and 2 story, 120 x 150 ft. garage, etc. Estimated cost $150,000. J. J. Lamb, 318 Main St., Orange, Archt.

N. J., Newark—Owner, c/o Romolo & Bottelli, 45 Branford Pl., Archts. is receiving bids for a 1 story, 125 x 250 ft. garage, etc. at New and Wilsey Sts. Estimated cost $150,000.

N. J., Newark—Whittier Lumber & Millwork Co., 415 Adams St., will build a 3 story factory on Haynes Ave. Estimated cost $40,000. Private plans.

N. J., Paulsboro — Vacuum Oil Co., awarded contract for a 2 story, 122 x 222 ft. can factory.

N. Y., Brooklyn—J. S. Lieb, 1429 President St., had plans prepared for a 1 story, 92 x 200 ft. garage, etc. at Albany Ave. and Rutland Rd. Estimated cost $40,000. M. Heisch, 26 Court St., Archt.

N. Y., Brooklyn — One Hundred Four South Eighth St. Corp., S. Bretholtz, Pres., 1501 Broadway, New York, had plans prepared for a 2 story, 90 x 120 ft. garage at Berry and Eighth Sts. here. Estimated cost $65,000. O. Goldschlag, 1482 Broadway, New York, Archt.

N. Y., Brooklyn—S. A. Sweedler, 1204 Union St., had plans prepared for a 2 story, 75 x 106 ft. garage at 89th St. and 5th Ave. Estimated cost $60,000. Bly & Hamann, 551 Nostrand Ave., Archts.

N. Y., Long Island City—Bayonne Steel Co., M. Katz, 233 West 19th St., awarded contract for the construction of a plant at School St. and Anable Ave. Estimated cost $80,000.

N. Y., Long Island City—Phelben Realty Co., Bank of Manhattan Bldg., had plans prepared for a 1 story, 97 x 164 ft. garage at 79th St. and 47th Ave. Estimated cost $50,000.

N. Y., New York — B. G. & J. Realty Corp., B. Joffin, Pres., 2174 Tilbout Ave., had plans prepared for a 2 story, 91 x 94 ft. garage at Honeywell Ave. and Tremont St. Estimated cost $55,000. N. Rotholz, 252 East Burnside Ave., Archt.

N. Y., New York—Clare Holding Corp., 330 East 149th St., will build a 1 story, 99 x 236 ft. garage at 151st St. and Park Ave. Estimated cost $100,000. Moore & Landsiedel, 148th St. and 3rd Ave., Archts. Noted May 24.

N. Y., New York—Grand Terrace Construction Co., H. Gilman, Pres., 1275 Boscobel Ave., had plans prepared for a 72 x 187 ft. garage at 237th St. and Broadway. Estimated cost $400,000. G. W. Suidler, 4215 3rd Ave., Archt.

N. Y., New York—One Hundred Seven West Thirteenth St. Corp., H. Weil, Pres., c/o Horace Ginsberg, 222 East 42nd St., Archt., had plans prepared for a 6 story, 40 x 84 ft. garage. Estimated cost $40,000.

N. D., Bismarck — International Harvester Co., 6060 Michigan Ave., Chicago, Ill., will build a 1 story sales and service station at Fifth Ave. and Main St., here. Estimated cost $50,000. Noted May 17.

O., Canton — Central Alloy Steel Corp., 8th St. N. E., will soon receive bids for the construction of 15 coke ovens, etc. Estimated cost $600,000.

Okla., Oklahoma City—Long Bell Lumber Co., Long Bldg., Kansas City, Mo., is having preliminary plans prepared for a 140 x 300 ft. lumber mill on Frances St. here to replace fire loss. Estimated cost $150,000.

Pa., Charleroi—West Penn Power Co., W. P. Bldg., Pittsburgh, will build a 1 story, 83 x 149 ft. garage here. Estimated cost $80,000. Sanderson & Porter, 52 William St., New York, Engrs.

Pa., Langeloth—American Zinc & Chemical Co., Clark Bldg., Pittsburgh, awarded contract for a 1 and 2 story addition to plant here. Estimated cost $400,000.

Pa., Pittsburgh—Pittsburgh Parking Garage Inc., Penn Ave., plans the construction of a 7 story, 80 x 200 ft. garage at 411 Penn Ave. Estimated cost $350,000. Private plans.

S. D., Sioux Falls — Chicago, St. Paul, Minneapolis & Omaha Ry., 225 West Jackson Blvd., Chicago, Ill., will build a mechanical coaling plant at Fifth Ave. and Main St., here. Estimated cost $50,000. H. E. Barlow, St. Paul, Minn., Ch. Engr.

W. Va., Weirton—Weirton Steel Co., will soon receive bids for addition to plant including new striper building, new soaking pit building, etc. Estimated cost $1,350,000.

Wis., Milwaukee—Drott Tractor Co., 123 Wisconsin Ave., awarded contract for a 2 story, 90 x 130 ft. service building at 38th St. and Blue Rd. Estimated cost $80,000. Noted May 17.

Wis., Wauwatosa—R. H. Bierman, 123 Wisconsin St., Archt., will receive bids June 4 for a 2 story 75 x 125 ft. garage at Greenfield and West Main Sts. Owners' name withheld. Noted May 10.